

57
232
26
0.181
**THE AIR BRUSH
AND THE PHOTOGRAPHER**

A handbook of common-sense information about the air brush and its uses in photography: for improving, finishing and coloring prints; retouching negatives; working-in backgrounds; coating special papers, and in pictorial photography

The Photo Miniature

VOLUME XVI : MARCH, 1921 : NUMBER 181

**NEW YORK — TENNANT AND WARD
LONDON — HOUGHTONS, LTD.**

Published Monthly : Subscription Price, Postfree, per year \$4 (Abroad 16/-)
Copyright, 1921, by Tennant and Ward, New York

The Photo-Miniature: No. 153

OPTICAL NOTIONS FOR PHOTOGRAPHERS

By GEORGE E. BROWN
*Editor of The British Journal
of Photography*

Simple explanations of some of the optical principles of light action upon which photography is based, showing their significance and application in everyday work—as in color processes, enlarging, copying, etc.

**SOURCES OF LIGHT
PARALLAX ILLUMINATION
AND THE LAW OF
INVERSE SQUARES**

**REFLECTORS AND
MIRRORS—THEIR DIFFER-
ENT QUALITIES**

**HALATION
DIFFUSION, TRANSMIS-
SION, AND REFLECTION
OF LIGHT IN
ENLARGING & DARKROOM**

**LIGHT SCATTER IN
CAMERAS**

REFRACTION

LIGHT FILTERS

PRISMS

*A book of absorbing interest
and very practical*

Price 40 cents postfree

TENNANT AND WARD

103 PARK AVENUE NEW YORK

The Photo-Miniature: No. 174

HOME AND GARDEN PORTRAITURE

The only handbook to this fascinating field of work, in which the amateur can excel the best professional work, and the professional can find a gold-mine of new business.

Plain and practical information, from beginning to end, giving working methods and discussing the possibilities from the viewpoint of experience.

THE FIELD EQUIPMENT

**LIMITATIONS OF
HAND CAMERAS**

LENSES AND THEIR USE

INDOOR ILLUMINATION

**ROOMS, STAIRWAYS,
DOORWAY, AND WINDOW
PORTRAITS**

**REFLECTORS,
BACKGROUNDS**

LIGHT TONE EFFECTS

MIRROR PORTRAITS

DE MEYER EFFECTS

PORCH PORTRAITS

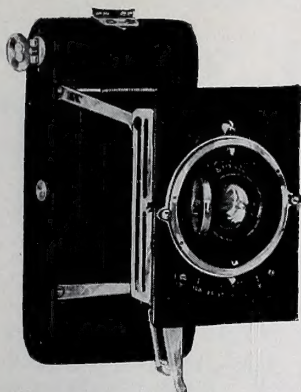
**GARDEN PORTRAITURE
ILLUSTRATED**

Price 40 cents postfree

TENNANT AND WARD

103 PARK AVENUE NEW YORK

Kindly mention **THE PHOTO-MINIATURE**



For $1\frac{5}{8} \times 2\frac{1}{2}$ inch pictures

Ansco V-P No. 0

(Focusing Model)

SMALLEST of the Ansco V-P series but, like the others, built to serve the most exacting user.

Efficient, durable, and well equipped, it gives negatives *both* sharp and fully timed with hand exposure not only in the strong midsummer sunlight but also in the weaker light of fall and winter, its construction permitting the effective use of the larger apertures without sacrifice of definition.

The Modico Anastigmat opens to F 7.5, the Ansco Anastigmat to F 6.3, allowing generous exposure, while the focusing device gives a sharpness to the negative unapproached by fixed-focus cameras of this size at apertures larger than F 11.3. Good enlargements are thus always assured.

Self-opening, rigid as a box, accurate, and finely finished

A camera for fall and winter use when tripods are a nuisance.

A practical and always treasured gift.

Write for catalog

Ansco Company

Binghamton, N. Y.



The Photo-Miniature

¶ A monthly magazine of photographic information, edited by John A. Tennant, for the man who wants the plain facts about one thing at a time. It is unique among photographic journals in the following vital points. ¶ Each number is a complete book in itself. Each number deals with a different subject and tells all worth knowing about its subject. ¶ Its information is fresh and original, simply written, without waste of words or space, by practical workers from actual experience. Always clear and to the point, comprehensive, not long-winded. ¶ It is carefully edited, well printed and linen-stitched so that it opens flat like a book for easy reading. Its pages are compactly filled, giving as much information as the average dollar book, in flexible form, fitting the coat-pocket. ¶ Sold by dealers everywhere at 40 cents per copy [or 1/8 abroad.] Subscription, postfree \$4 per year. [Abroad 16/-.] ¶ A complete set of all the numbers published: Nos. 1 to 180, Volumes I to XV, offers the most comprehensive library of photographic information in the language. Apply to American publishers for price of sets or out-of-print issues needed to complete your set.

A List of Numbers Obtainable from Most Dealers:

No. 182. THE PHOTOGRAPHIC STUDIO. Its Construction and Equipment. Illustrated. 40 cents. Ready in May.

No. 181. THE AIR BRUSH AND THE PHOTOGRAPHER. A practical working manual for all the uses of the air brush in photography. Illustrated. 40 cents.

No. 179. PHOTOGRAPHIC EMULSIONS. The formulas and methods of an expert for making dry plates, lantern slide and process plates, development and bromide papers, emulsions on canvas, etc. 40 cents.

No. 178. PHOTOGRAPHY AS A CRAFT. Practical and pointed methods of varying the result obtained in negatives and prints, for those who know what they want before they begin. Illustrated. 40 cents.

No. 177. SELLING PHOTOGRAPHS TO ADVERTISERS. How to make money with your camera, producing and selling photographs for illustrating advertisements. How to get into the market. Illustrated. 40 cents.

LIST CONTINUED ON NEXT PAGE

Kindly mention THE PHOTO-MINIATURE

The Photo-Miniature Series

OF PRACTICAL HANDBOOKS ON PHOTOGRAPHY

LIST CONTINUED FROM PRECEDING PAGE

No. 176. SIGNIFICANCE OF DESIGN IN PICTURE MAKING.

Explaining the importance of pattern as the simplest way of getting into the pictorial game. Illustrated. 40 cents.

No. 175. STEREOSCOPIC PHOTOGRAPHY. The only book on this beautiful but neglected method of photography which gives the perfect photograph. 40 cents.

No. 174. HOME AND GARDEN PORTRAITURE. Plain and practical methods for amateurs and professionals. Covers the whole field. Illustrated. 40 cents.

No. 173. FIGURES, FACTS AND FORMULAS OF PHOTOGRAPHY. Second Series, 1914-1918. A reference book. 40 cents.

No. 172. THE HANDS IN PORTRAITURE. The only guide to this important detail in practice; written by an expert and profusely illustrated. 40 cents.

No. 171. RETOUCHING AND IMPROVING NEGATIVES. All methods—pencil, brush, knife, etc. 40 cents.

No. 169. PHOTOGRAPHIC WORDS AND PHRASES. A pocket dictionary for instant reference. 40 cents.

No. 168. HOW TO DEVELOP THE NEGATIVE. A practical handbook to the twelve best methods. 40 cents.

No. 167. MODERN PHOTOGRAPHIC DEVELOPERS. A little cyclopedia of information on the new developers. 40 cents.

No. 161. SPORTS AND THE CAMERA. How to get good pictures of all outdoor sports. Illustrated. 40 cents.

No. 153. OPTICAL NOTIONS FOR PHOTOGRAPHERS. An uncommon book explaining everyday optical problems in reflection, illumination, refraction, diffusion, halation, generally left unexplained in textbooks. 40 cents.

No. 151. REFLEX CAMERAS AND FOCAL PLANE SHUTTERS. The only guide to photography with Graflex and similar reflex camera equipments. By an expert. Illustrated. 40 cents.

No. 142. PROFITABLE PHOTOGRAPHIC PROCESSES. Printing on fabrics, silk, etc.; watch dials and caps; imitation enamels, enlarging on fabrics; pictures on metals, charms, etc. 40 cents.

No. 115. PLATINUM PRINTING. A handy guide to the making of all sorts of platinum prints. 40 cents.

No. 60. WHO DISCOVERED PHOTOGRAPHY? The most interesting account of the beginnings of photography and the men who made the first photographs. Illustrated. 40 cents.

If your dealer cannot supply apply to the publishers

**PUBLISHED BY TENNANT AND WARD
AT 103 PARK AVENUE, NEW YORK**
Chicago Wholesale Agents: Burke and James, Inc.
Agents for Great Britain: Houghton's, Ltd., London
Agents for Australasia: Kodak (Australasia) Ltd., Sydney

Kindly mention THE PHOTO-MINIATURE

Tennant & Ward's List

of photographic books of various publishers supplied on direct order only at prices given below

THE FUNDAMENTALS OF PHOTOGRAPHY

By C. E. Kenneth Mees, D.Sc. 111 pp. illustrated. \$1

THE PHOTOGRAPHY OF COLORED OBJECTS

By C. E. Kenneth Mees, D.Sc. 136 pp. illustrated. 56 cents

THE PHOTOGRAPHY OF MOVING OBJECTS

By Adolph Abrahams 152 pp. illustrated. Cloth 75 cents

CHEMISTRY FOR PHOTOGRAPHERS

By W. R. Flint 202 pp. Cloth \$2.50

OPTICS FOR PHOTOGRAPHERS

By H. Harting. Translated by F. R. Fraprie 224 pp. \$2.50

PICTORIAL COMPOSITION IN PHOTOGRAPHY

By Arthur Hammond 212 pp. illustrated. Cloth \$3.50

CASH FROM YOUR CAMERA

By F. R. Fraprie. With List of Buyers 87 pp. Paper \$1

THE COMMERCIAL PHOTOGRAPHER

By L. G. Rose. Complete. Practical 145 pp. illustrated. \$4.15

THE AIR BRUSH IN PHOTOGRAPHY

By Geo. Stine. With Lessons 68 pp. illustrated. \$3.50

A TREATISE ON THE AIR BRUSH

By S. Frazer. With Lessons Illustrated. \$1.50

PHOTO-ENGRAVING PRIMER: LINE AND HALF-TONE

By Stephen H. Horgan. Practical Methods 81 pp. \$1.50

ETCHING AND FINISHING: LINE AND HALF-TONE

By P. R. Raymer 88 pp. illustrated. \$1.50

JOHNSON'S ART OF RETOUCHING NEGATIVES AND FINISHING PRINTS IN BLACK AND WHITE AND VARIOUS COLORS

Tenth edition. Revised and Rewritten 1920 92 pp. illustrated. \$2.50

COLORING PHOTOGRAPHS AND LANTERN SLIDES

By R. Penlake. All methods 76 pp. Cloth \$1

THE PROJECTION OF LANTERN SLIDES

By Lewis Wright. 1920. Rewritten 87 pp. Cloth \$1.70

THE STORY OF THE MOTION PICTURE

By Ben Lubshez. B. C. 65 to 1920 A. D. 64 pp. \$1

THE PORTRAIT STUDIO

By "Practicus." An English pamphlet 40 pp. Paper 50 cents

COMMERCIAL PHOTOGRAPHY

By "Practicus." British Methods 54 pp. Paper 50 cents

SKETCH PORTRAITS

By S. Adamson. Practical Methods 26 pp. Paper 50 cents

PICTORIAL PHOTOGRAPHY IN AMERICA 1921

By the P. P. of A., N. Y. Annual: Illustrated. \$3

Address your orders to

TENNANT & WARD, 103 Park Ave., New York

Kindly mention THE PHOTO-MINIATURE

Tennant & Ward's List

of "worth while" books on photography obtainable through dealers or the publishers

WALL'S DICTIONARY OF PHOTOGRAPHY

Tenth Edition, 1920. Revised to date and largely rewritten by F. J. Mortimer. 700 pages; 2,000 references. Cloth: postpaid \$5.

THE PHOTOGRAPHIC RESEARCHES

OF FERD. HURTER AND VERO C. DRIFFIELD

A Memorial Volume, edited by W. B. Ferguson and republishing all their original pages with a Bibliography of Later Work. 374 pages. Illus. Cloth \$9.

PHOTOGRAMS OF THE YEAR 1920

An International Illustrated Review of the World's Progress in Pictorial Photography. Reports of the Great Exhibitions, a Critique and 86 Plates. Stiff paper covers \$2.50. Cloth, \$3.50 postpaid.

PENROSE'S ANNUAL 1921

The Process Year Book and Review of Graphic Arts. Volume 23. Edited by W. Gamble. With 88 plates in color, gravure and other methods. Postpaid \$5.

PRACTICAL PHOTO-MICROGRAPHY

The Principles and Methods Plainly Explained for Beginners. A common-sense book. By Geo. West. 160 pages; with 8 plates, table, etc. Postpaid \$2.50.

BROMOIL, BROMOIL TRANSFER AND OIL PRINTS

By James A. Sinclair, Fred Judge and other experts. Practical Working Methods. Illustrated. Postpaid \$1.

PHOTOGRAPHING FLOWERS AND TREES

With an essay on "The Decorative Use of Natural Forms." By J. Horace McFarland. Illustrated. 50 cents.

THE PHOTO-MINIATURE SERIES

Monographs on Photography. Edited by John A. Tennant. See special list for titles. Per copy 40 cents. Per year \$4.

THE "BIG SIX" SERIES

Popular Photographic Handbooks. Cloth, 60 cents.

Send for General Book List, Free. We can supply any photographic book published—at the publishers' price.

TENNANT AND WARD, Publishers
103 Park Avenue New York

TENTH EDITION 1920
700 Pages, 2,000 References

Wall's Dictionary *of* Photography

and Reference Book for
Amateur and Professional
Photographers

Revised and Largely Rewritten by
F. J. MORTIMER

Price \$5.00

At your dealer's or
Sent Postpaid on Receipt of Price by the
AMERICAN AGENTS

TENNANT AND WARD
103 PARK AVE., NEW YORK

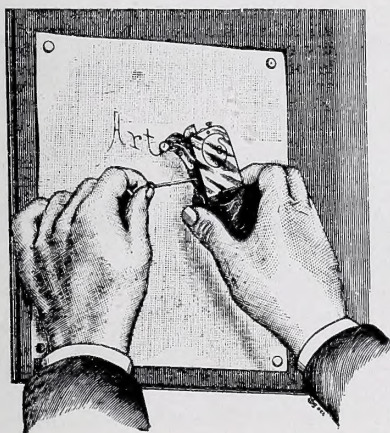
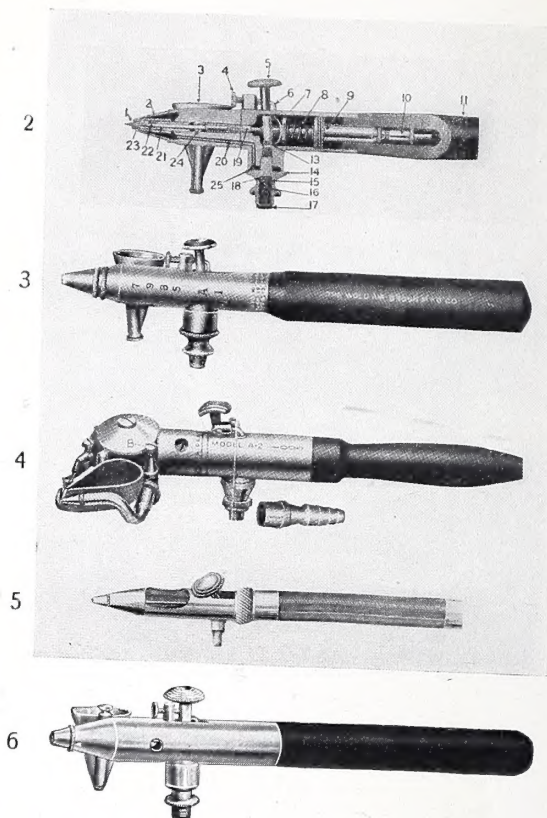


Figure 1
The Walkup Air Brush in Use



1. The Walkup Air Brush (overleaf).
2. Cross-Cut of Wold Air Brush, "A-1."
3. The Wold Air Brush, "A-1."
4. The Paasche Air Brush, "A."
5. The Aerograph, "A."
6. The Thayer and Chandler Fountain Air Brush.

The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

Volume XVI

March, 1921

Number 181

The Air Brush and the Photographer

Since time immemorial various devices have been employed by artists and craftsmen in applying colors to a surface. The commonest of these is the implement known as a brush. The artist's brush, a tuft of flexible material such as hair or vegetable fiber attached to a stock or handle, runs back to a venerable antiquity. It was sung by Homer, *circa* 1000 B. C. and is still widely used, unchanged in form and substance since that remote time. Three thousand years after Homer, however, and in our own day, Liberty Walkup, an American, introduced a daring innovation to which he gave the name Air Brush, *circa* 1886 A. D. His description of his invention, as "an art tool, designed to replace the artist's brush for the rapid and uniform distribution of color on any kind of surface by an atomizing jet of air," cannot be improved. In form and shape Walkup's air brush was, and is, unlike anything ever seen upon the earth. But in use it was, and is, satisfying and efficient for its purpose, fulfilling all its inventor's claims. On another page I reproduce the only available illustration of the Walkup brush in use, Fig. 1. The air brush of today, more presentable and more convenient in the hand, closely resembles the familiar stylographic pen, with the addition of a length of rubber tubing for the supply of the air pressure by which the color is distributed.

A Finishing Tool. The usefulness of the air brush to the photographer chiefly concerns the after-treatment of negatives and prints. By the term after-treatment here is meant any manipulation of or hand work on the negative intended to change, modify or improve its quality for printing or enlarging purposes; or any method of modifying, "working-up" or finishing prints in monochrome or colors. Primarily, then, the air brush is a finishing tool and belongs to the retouching or finishing department of the professional, specialist and commercial studio. As such it has a vital interest for photographers, an interest not yet sufficiently recognized or appreciated. It is the purpose of this little book to develop a larger interest in the air brush, and to help photographers to a better appreciation of its many-sided usefulness in photography.

Other Uses. Apart from its usefulness as a finishing tool, the unique facility of the air brush in the application of colors, sizes, varnishes, lacquers, sensitizing solutions and the like to any kind of surface, invests it with interesting possibilities for other kinds of work. It is said that those who use the air brush find a new use for it every day. I don't doubt it. For laying delicate tints on mounts, stencil designing and mat making for display mounts, folders or commercial and sample albums; blending several portraits or commercial photographs of articles printed or mounted as combinations; hand work in pictorial photography; isolating a figure in a group in copying; sensitizing and pigment coating of papers for gum-bichromate printing, and the sizing and sensitizing of thin tissues or extra thick papers for special printing papers, with many similar uses, the air brush undeniably offers many advantages over the old, familiar hand methods.

Further Afield. Outside of purely photographic lines, the air brush is widely used by photo-engravers as a retouching tool in preparing originals for reproduction. Thus the exquisitely finished photographs of machines, furniture, automobiles and jewelry seen in the catalogues of the manufacturers of these products represent, alas! not so much the perfection of photographic methods as the super-excellence of air-brush

work. Lithographers use the air-brush as an indispensable aid in designing and working on the stone or plate; newspaper illustration departments, where the meanest apology for a photograph must be transformed "in a jiffy" into an attractive picture of some famous person or place, could hardly exist save by the grace of Walkup's wonderful invention. And so in a hundred crafts, wherever brush or pencil work, tinting or coloring are used: in drafting, designing, shading, stencil or decorative work on metals, fabrics and pottery, tinting laces, feathers, fans or wooden articles, in the illustration of advertisements, poster and sign making, cartographic and survey work, etc., the air brush finds an ever-increasing usefulness. Similarly, in Brobdingnagian scale as a "sprayer," the air brush does yeoman service in the industries, where it is generally employed for applying paints, bronzes, lacquers and varnishes in the "finishing" of surfaces, from the interior casing of a Vest Pocket Kodak to the walls and ceilings of the largest of manufacturing plants. Here, however, we wander from the air brush as an art tool. In these pages we must confine ourselves to its usefulness to the photographer.

Conservatism. We photographers, forever aping the "artist," are ultra-conservative, yielding up our conventions and traditions only in the face of persuasive and persistent advertising. The air brush has not yet been advertised in this way to photographers. As a consequence it is better known and more widely appreciated by commercial art workers outside photography, than by the photographer for whom it was invented. For which reason I write it large, here in the beginning, that for every purpose where the use of a brush offers advantage in photography, the air brush as far surpasses the classic brush of the painter as the electric motor surpasses the ancient man and horse power which it has displaced.

An Interpolation. Even the artist does not confine himself to a brush. It is told of some that the hand was directly applied to the canvas to produce the desired effect. There was one, indeed, who boasted that a brush could not be found in his studio. Doubtless he

used his palette knife, as well as hand and fingers, in applying his pigments. Why not? As we all know, in some methods of coloring photographs and working on the back of a negative, the finger tip, with or without a piece of soft rag, will do work that no other instrumentality can do so well. Similarly, in other methods, we use powder, pastel and crayon, or color the film behind glass, in the effort to get softness and "blend" in place of the hard and fast touch of the old-style brush. It is in this, the delicate application and precise distribution of color, that the air brush is the *dernier cri*. It will give the finest line and softest detail of which the crayon is capable. In area work, the laying on of washes and infinitely graduated tints, the air brush is unapproachable in facility and result. More than this, the air brush responds with a better grace to less skillful hands, and does its work with an incredible saving of time.

Not a Machine. The quality of the results obtained with the air brush depends most largely on the mental attitude or viewpoint of the worker, apart, of course, from the mere manual skill applied in its use. It is not a machine, but a hand tool. Too often the air brush is spoken of as a mechanical tool, even by those who should know better. I protest the phrase. It is true that in the hands of a mechanic without feeling or taste, the air brush produces work chiefly remarkable for its mechanical perfection. The average air brush catalogue, with its terrifying display of parts and equipments, emphasizes this mistaken notion. These accessories, however, are merely instrumentalities for supplying and controlling the air pressure which gives the air brush its characteristic facility in color distribution. As a matter of fact, the air brush is as truly an art or hand tool as the painter's brush, capable of as large a variety of effects, as responsive to and revealing as fully whatever measure of individuality its user may possess. It is the man behind the brush that tells, just as it is in the case of the artist's brush. The art in the result must come from the man whose hand wields the brush.

The Art of It. Note well the significance of that

last sentence. The rare qualities and effects we admire in the masterpiece of painting or in the cleverly handled water color sketch are produced, not by the brush of the artist, but out of the years of training and acquired skill he puts into his use of the brush. So with the air brush. It offers an undreamt-of facility in obtaining desirable effects by the application of color to a surface. Rightly handled, it will give these desirable effects more rapidly with, perhaps, less skill than the old-style brush demands. But it is only a brush at best, and the quality of the result varies, as with any other sort of brush or tool, according to the knowledge and skill of the individual worker in its use. I cannot put it plainer. Possessing an air brush, and knowing how to use it in a mechanically efficient way, will not give the reader any special skill in drawing, art anatomy, composition, the balance of light and shade, the use of color or any of the other essentials of artcraft as applied in photography. It follows that the photographer who seeks to get the most out of his air brush must bring that trained knowledge of the methods of art which the painter brings to his use of the brush, together with a special, technical skill in the methods used in retouching and "finishing" negatives and prints. As to this, however, there is generally at least one worker in every photographic studio possessing some sort of art training, and it is into his or her hands that the air brush should be placed. With which preliminary discussion of the air brush and its possibilities, we may now pass on to a detailed study of the brush as a tool and the methods of its use in photographic practice.

Commercial Forms. The form and make-up of the air brushes of today may be seen in the accompanying illustrations. For more complete data of equipment the reader is referred to the catalogues of the makers. In all these lists will be found a bewildering variety of air brushes and equipments of different designs, with many of which the photographer need not concern himself, as intended for other than photographic uses. The essential features of the air brush equipment are the hand piece or brush proper, a container for the supply of compressed air and some means of regulat-

ing its pressure, with the rubber tubing connecting the two.

The Principle. Differing in minor details of design, interior construction and operation, all air brushes are alike in principle. They project liquid pigment in the form of fine spray produced by the aid of compressed air. We can broadly visualize this as a combination of the stylographic pen and the atomizer. In the stylographic pen the ink is carried in a reservoir within the handle, being drawn along the needle or wire which forms the writing point by the force known as capillary attraction. You touch the pen to paper, the ink flows and you write, the fineness or thickness of the letters being controlled by the annular space or "feed" at the point through which the needle just protrudes. In the atomizer the liquid is projected, as a fine spray, through a tiny nozzle, being atomized near the point of emergence by a stream of air produced by hand pressure on an air-filled rubber bulb connected with the bottle or container holding the liquid.

How the Air Brush Works. Let us look at the interior details of an air brush and see how it works. In Fig. 2 we have a cross-cut of the Wold Air Brush "A-1" which, as sold, is seen in Fig. 3. It has a hollow cylindrical handle (11) closed at the rear end, having at the other end an open nozzle or "color tip" (1), in shape a truncated cone. There is an inner, conical nozzle concentric with the color tip, and so placed as to have an annular space outside of it forming the "projecting air tubes" (23). Within these tubes we see a long, accurately pointed needle (22) which has a back and forth movement from the color tip, with a guide (7) and spring tension (8), with bearings (9) and a "chucking cap" (10) for the exact adjustment and alignment essential to its proper movement. The pointed end of the needle enters the inner end nozzle (23), closing it when moved forward and opening it when drawn back—thus controlling the flow and amount of color projected from the tip. The movement of the needle itself is controlled by a double-action finger piece (5) called the "air and color distributing lever," which is operated by the pressure of the first finger (or thumb,

according to the design of the brush). Immediately in front of the distributing lever is the "line adjustment screw" (4) which, by controlling the forward movement of the needle, adjusts or "sets" the width of the spray or line and regulates the flow of color to the tip. The color is held in a small cup (3) attached to a side nozzle connected with the "color inlet" (24) admitting the color to the needle valve; or it may be carried in a reservoir within the forepart of the brush as in the Aerograph "A," a British brush (Fig. 5); or in a spoon or pan close to the tip, as in the Paasche brush "A" (Fig. 4) and in the original Walkup brush (Fig. 1). Referring again to Fig. 2, a third nozzle is provided (17) to receive the rubber tube or hose connected with the compressed air supply. When the air is turned on it passes through this nozzle into an air chamber (25) from which it is released by a downward pressure of the distributing lever (5), passing into an air duct (20) to a junction with the color inlet (24), there reducing the liquid pigment to an infinitely fine spray which travels along the needle and issues from the end nozzle or tip (1) with high velocity.

In Operation a downward pressure of the first finger tip on the lever release (5) opens the air valve and admits a stream of air. A downward and slightly backward pressure of the lever (controlled by the line adjustment screw and the spring tension) draws the needle back from the inner tip, thus opening the color valve constituted by the inner end nozzle and the needle. By this double-action movement of the distributing lever the stream of air passes from the air chamber (25) to the air cap (2) forming a suction at the color inlet (24) and drawing the color around the needle into the color tip head (21), from which it is projected or blown out as fine spray in the form of a cone, with its base on the surface being worked on (as a print) and its apex at the nozzle or point of the color tip.

Other Air Brushes differ somewhat in their construction and operation from that just described. For these differences the reader is referred to the instruction book accompanying every brush, which explains its mechanism and use. This instruction book should be care-

fully studied, brush in hand, before any work is attempted. Among the Wold brushes, Models "A-1" and "U" are designed for the photographer's use. In the latter the form of the distributing lever is changed so that a single downward pressure controls both air and color, the line adjustment screw being placed behind the lever. Of the Paasche brushes, Models "A" and "B" are advised for photographic uses. In these models the color cup (pan) is so placed and adjusted that the color is not taken into the shell or body of the brush—a desirable feature which obviates any tendency to clogging of the brush on this score. The Paasche Model "C" has a thumb-action lever release, "for use by artists with unsteady hands" says the obviously ante-prohibition catalogue. The Aerograph, designed by an American, Charles L. Burdick, is made and marketed in England, not being available in this country. Its novel arrangement of the color receptacle in the fore body of the brush, and the knurled band behind the distributing lever which acts as the line adjustment screw, are points of difference worth noting. The Fountain Air Brush of Thayer and Chandler, seen in Fig. 6, is an old favorite among photographers, being the first modification of the Walkup brush. Whether Walkup's brush is still in the market or not I do not know, no response coming to my request for information.

The Choice of an Air Brush. The advantages of the different designs and models available are fully set forth in the makers' catalogues. I can offer no advice as to a choice among them. They are all good and completely equipped for their purpose, so that choice must be a matter of personal preference. At the easel of a professional worker one will usually find several different makers' brushes on the hangers or rests, adjusted and used according to the worker's preference in different classes of work. The reader will do well, before purchasing an air brush, to consult with an experienced air brush operator and, if possible, to see several air brushes in use.

Manipulation. The air brush, in use, is held as one holds a pen, at a right angle to the work on the easel,

and with the first finger crooked instead of lying flat, so that the tip of the finger rests squarely on the lever release. Supposing the color cup to be attached and the air turned on, the width or fineness of the color spray, regulated by the line adjustment screw, is governed by the backward movement of the distributing lever and by the distance away from the work at which the brush is held. For example, fixing the line adjustment screw for a line, a quick stroke of the brush across a sheet of paper, with the distributing lever pressed downward and forward against the line adjustment screw, and the brush held at half an inch from the paper, will give a fine (narrow) line of color. If now the brush is held at a distance of five to ten inches away from the paper, and the lever is pressed downward and slightly backward, the width of the spray will vary according to the distance, the adjustment of the line screw and the backward movement of the lever. The result in this instance will be a wash or area deposit of color instead of a narrow line. It is thus seen that the crucial point in air brush work lies in the mastery of this twofold movement of the distributing lever and the setting of the line adjustment screw. This can come only from practice. It is largely a matter of feeling or touch, as in piano or violin playing, and must be cultivated by the same assiduous practice. As skill comes, the pressure or movement of the distributing lever is varied unconsciously with the variation of the working distance, just as the retoucher changes the form and density of his pencil touch, from moment to moment, as needed by the work in hand. Thus the flow of color from the tip of the brush may be regulated so as to give a fine, vigorous line or an infinitely soft wash of thin, transparent color, the brush being held at different distances away, and the touch or pressure of the finger on the lever being different in each case. When applied as a thin wash or tint, the color deposit dries almost instantly (if working on glass, this should be slightly warmed), so that repeated washes can be superimposed, one over another, without fear of any injurious effect on previous coatings, until the desired depth or intensity of color is obtained.

Service Conditions. It is seen that the air brush is an instrument of fine workmanship and delicate adjustment. It follows that, like a watch, it must be kept scrupulously clean, with all its parts in perfect adjustment and alignment, if it is to give good service. Nothing more than reasonable care, however, is required. The parts most subject to wear and tear are generally made of platinum or non-corrosive metal, so that, barring accident and carelessness, repairs will rarely be needed. The needle is easily bent by careless handling. This will disturb the alignment and so affect the discharge of color. The chief trouble to be expected is the clogging of the delicate air and color ducts, color inlet and tip, with dried color, grit or other obstructions. All colors, except aniline dyes, contain a proportion of gum, and if left in the brush after use, will give trouble. The brush, of course, should always be cleansed after use. This is very simply accomplished by blowing water through it to remove any color remaining in the passages or tip. An occasional, supplementary blow with wood alcohol is well worth while. The re-adjustment and re-alignment of parts are the only critical repairs likely to be needed. For these it is advisable to send the brush to its maker, although the books give detailed instruction on these points. It is especially advised that the air brush should not be loaned or put into hands not familiar with its use. But the traditional jealousy of the artist as to lending his brushes will suffice as to this point.

The Air Supply. We now come to the accessories, chief among which is the indispensable air supply. This may be provided in several ways: by a small hand or foot operated pump connected with a small tank or container; an electric motor driven pump; or the use of liquified carbonic acid gas. The choice among these must be determined by the reader's need. Working details and the advantages of the different systems are explained in the manufacturers' catalogues and need not be repeated here. The essential thing is a regular and constant supply of compressed air to the brush—regular in flow and constant in pressure. For photographic purposes a pressure of from 20 to 30

pounds is generally advised, but this will vary according to the brush in use, the class of work in hand and the skill of the worker.

Hand and Foot Pumps. With these the air is pumped into the tank or container which forms part of the apparatus until a sufficient pressure is obtained, as indicated by a gauge attached to the tank. When once filled, a few strokes of the pump given by the operator from time to time will suffice to keep the air in the tank up to the required pressure. Where the air brush is not in constant use, or for use with a single brush, these hand or foot pumps are simple in operation, not expensive and quite efficient. For many years no other type was available. They have the disadvantage of possible irregularity in supply and variation in pressure, and when in constant use are said to set up a slight nervousness in the operator which has its effect on the quality of his work.

Motor Driven Pumps are more convenient in use and perfect in efficiency, being much used in commercial establishments where several brushes are kept in operation. They include an air compressor driven by a small electric motor with an automatic switch and pressure gauge, all compacted in one unit. In operation the motor driven pump is inexpensive and it can be operated on any electric light or power circuit, providing a steady and uniform air supply.

Gas Apparatus. Simplest of all methods of air supply, however, is the use of liquid carbonic gas. This can be obtained from any soda water or saloon supply house, in steel drums or cylinders of 20, 40 or 50 pounds, easily replaceable as needed and inexpensive in use. As so obtained the cylinder needs to be fitted with a reducing valve and pressure gauge for the regulation and control of the gas pressure in use. There need be no fear of danger in the use of these gas-filled cylinders if they are stored away from the direct rays of the sun, nearness to a fire or other source of heat. This system of air supply is cleanly and convenient, always ready for instant use, and the best available where electric or foot power are not obtainable or desirable.

Other Methods. Of the use of a water pump for

compressing the air, or of the belt-driven pump connected with a line of factory shafting, nothing will be said here. They are wholly practical in application, but hardly adaptable for use in the average photographic workroom or studio.

Easel. A sturdily built easel, readily adjustable and rigid when adjusted, is a big help to good work. The architectural designer's drawing table is most commonly employed, with a swinging arm at one side, carrying the color rack, brush rests and other tools. The color rack is a small, metal box designed to carry 8 or 12 two-ounce bottles containing a supply of as many different colors, each bottle fitted with a dust-proof screw top carrying a glass tube filler for taking supplies of color to the color cup on the brush as needed. The easel should be adjustable for a standing and sitting position, and should be placed so that an abundance of light, preferably from the north, falls on the work in hand at an angle of 45 degrees from above the operator's right shoulder. In addition to the supply of colors, the color rack should carry a small ($\frac{1}{4}$ inch) bristle brush for cleaning the color cup; carbon pencils H, HH, and HB; an etching knife; drawing pins; some powdered pumice; a bottle of ammonia water; rubber cement; a supply of frisket or mask paper; two or three small water-color brushes for pointing fine details, and a piece of pointed rubber eraser of good quality.

Colors. Common sense here means the use of the very best colors obtainable. It is essential that the colors used for air brush work be dustless, absolutely gritless, smooth-working and as permanent as may be. Cheap colors are apt to be troublesome in preparation and poor economy in use, change on exposure to light and air and so throw discredit on the work done with them. The quantity of color used for any single piece of photographic work is so small that color expense is not worth consideration. If you, later, come to the coloring of bromide enlargements for theatrical and advertising posters, measured by the square foot and generally short-lived in use, then you can begin to "count the pennies" in buying your air-brush colors.

Buy. Don't Make Them. It is possible to prepare

your own colors; but this means the most careful grinding, straining and what not to ensure smoothness and freedom from grit. There are many brands of air-brush colors in the market, reliable and ready for use, and the reader will do well to buy and use these rather than to attempt to make his own. Whether purchased in tubes (moist), bottles (liquid) or in powdered form, it will generally be desirable to mix working solutions of two or three different strengths for use by simple dilution; also by admixture to obtain special colors or shades. This applies especially to "black" and "sepia," where the liquid pigment must match the color or tone of the print to be "finished." A "neutral tint" is also much used. This may be obtained by mixing black and blue, or better, violet and gamboge. For working on negatives, i. e. in strengthening a weak portion, dyes or transparent colors are used; if for blocking out, then opaques.

Black. For preliminary practice work a good lamp-black (not waterproof) is advised, as with this the color can be removed, in case of mistake, by simply immersing the print in water and using a tuft of cotton. For work which is to be delivered, of course, permanent or waterproof color is used. In the use of lampblack the tone can be modified by the addition of water. Sometimes an admixture with Payne's gray will offer advantage. A cold black is obtained by admixture with a little indigo-blue, and a warm black by the addition of a small quantity of brick red. For a rich, deep black for reproduction prints, first work the print with a normal black, then superimpose a thin wash of sepia over the black.

Sepia. A good commercial sepia is readily obtainable, but the tones of "sepia prints" vary so widely and are sometimes so uneven in color even in the same print, that you may need a warm sepia, Vandyke brown, bister and brick-red in addition to the commercial sepia.

Color Lists. Theoretically, the many different colors or tints needed in air brush work may be obtained, if one uses true and pure colors, by mixture and combination of the primaries red, blue and yellow. But in

practice this means a knowledge of the harmony of colors and does not always result in clear colors for use. Those seeking such a knowledge are referred to such handbooks as Hatt's or Sanford's Manuals. The following lists give a variety of the colors most used, which the air-brush worker can keep on hand.

List 1. Alizarin-scarlet, rose-madder, Antwerp blue, French ultramarine, Prussian blue, burnt sienna, raw sienna, bistre, Vandyke brown, aureolin. These are transparent and permanent.

List 2. Vermilion, ultramarine blue, Hooker's green (light), chrome lemon, raw sienna, burnt sienna, mauve (reddish), crimson lake, sky blue, Hooker's green (dark), chrome orange, raw umber, venetian red and mauve (bluish).

A good "white," such as blanc d'argent or reproduction white is indispensable. These are opaque and free from lead, hence they do not change under light action.

Working with Colors. The general rule in the use of colors on a photographic base is to under, rather than over color, i. e. to avoid garishness by suggesting rather than by applying a heavy wash of vivid color. The air-brush expert does much of this sort of coloring by superimposing one tint over another to get the color effect desired. To strengthen shadows apply neutral tint; to make the tone colder, apply blue; if the tone is too cold or gray, spray on a little crimson or yellow as may be needed. Sometimes a spray of gum-water is all that a shadow needs to warm and lighten it in tone.

Progressive Lessons. We can now profitably take up the practical use of the air brush. This should begin with a series of progressive practice lessons, covering the proper holding and operation of the brush and the method of applying or distributing color. When these have been mastered, the reader may begin the working-up or finishing of large prints in black and white or sepia, thence going on to coloring or working with colors. It is advisable to learn how to use the air brush on paper prints or photographs before attempting to work on negatives, the glass or gelatine surfaces of which require more skill in handling.

Holding and Operation. Fix a sheet of practice paper on the easel board and place the easel in a good light and position favorable to comfort in working. Any cheap, matt-surfaced white paper free from spots or lumps will serve. See to the air supply and adjust the pressure to 20 or 25 pounds. If the rubber hose connecting air supply tank and brush is new, it may hold some particles of dust, grit or powder, so that it will be well (before connecting it with the nozzle on the brush, to blow out the air line so as to clear it of dust or grit by turning on the air from the tank. Now connect the air line with the brush and give this a blow through to make sure that the delicate passages of the brush harbor no dust or grit. Half fill a color cup with lampblack and attach it to the brush by gently connecting it with the opening at the side of the brush, and place the brush on the easel rest ready for use. Set the line adjustment screw for a line, i. e., so that the shaft of the distributing lever rests against the nut or tip through which the line adjustment screw passes.

The First Lesson. Sit comfortably at the easel so that the right hand and arm can move freely in any direction over the practice sheet. Take the brush in hand, hold it as you hold a pen, with the first finger tip well forward over the distributing lever, and at a right angle to the sheet. Turn on the air. We are going to practice the making of horizontal lines across the practice sheet, about an inch apart with an inch margin at each end. The object in view is to make a clearly defined line of even width and even in color or tone. Bring the brush into position with the tip over the left-hand edge and near the top of the sheet, at a distance away of about half an inch from the surface of the sheet. Now start the stroke as if to move in a straight line from left to right across the sheet. While the brush is in motion and when the tip reaches the point set for the beginning of the line, press the distributing lever downward and forward (i. e. against the line adjustment screw), and keep the brush in steady movement across the paper at the half-inch distance. When within an inch of the right hand edge of the sheet, with the brush still in motion, release the pressure on the

lever, thus stopping the flow of color and ending the line or stroke. The trick here is to learn to keep the brush in motion without pause or hesitation, and to start and stop the flow of color while the brush is in motion. To start the brush in motion and the flow of color simultaneously or to stop them simultaneously means a blot of color. Learn, also, to start and stop the flow of color in a gentle and continuous motion or pressure and release of the distributing lever, not with a jerky or spasmodic movement. If you watch an air-brush expert at work, his brush is seen to be in perpetual motion, restlessly moving with a free, easy waving movement and continual variation of the distance, over the face of the work on his easel. The pressure of his finger on the distributing lever and flow of color from the top of the brush are, however, by no means continuous, but are stopped and started from moment to moment as he needs to distribute color at this or that part of his work.

This practice lesson in making horizontal lines, even in width and uniform in color, without spot or blot marking the beginning or end, should be kept up until fair proficiency has been obtained. Its purpose is to teach the student how to control the double action of the distributing lever; how to start the air and color flow with a gentle, continuous pressure after the brush is in movement and to release the finger pressure before the end of the stroke; how the width or fineness of the line is controlled by the line adjustment screw and the distance between tip of brush and practice sheet.

Second Lesson. When the making of a good, clean horizontal line has been mastered, the reader should proceed to the making of vertical lines from the top to the bottom of the sheet; then of short lines at various angles resembling the angular strokes of the penmanship copybook of childhood; then of small and large curves, dots placed at fairly regular intervals, circles, ovals, the double or return curve and so on. In this way only are the hand and finger trained to control the movement of the brush and finger piece, to begin and end the stroke without blot, so that the lines are lighter, rather than darker, at the beginning and end. In this

practice work the attempt should be made to completely finish or cover the practice sheet with the brush in unceasing motion, and the starting and stopping of the color flow under control at all times.

Third Lesson. The distribution of color within an area may next be attempted. Here the object is to learn how to apply color in an even or graduated tint within a given area or space. At first, one may outline with a pencil variously shaped spaces on the practice sheet, and try to fill them as evenly as possible with a tint or deposit of color, working with the brush at a distance of ten inches from the sheet. Set the line adjustment screw for a line, control the color flow by the finger pressure on the lever, the first downward pressure opening the air valve and so starting the air, the further downward and slightly backward pressure opening the color valve and starting the flow of color, which latter is in part regulated by the setting of the line adjustment screw and the spring tension behind the needle.

The depth of the tint is governed not only by the distance between brush and sheet, but also by the speed of the stroke. In this lesson learn to maintain an even distance between the tip of the brush and the sheet, and to keep the brush moving at a uniform speed. It is obvious that the deposit or tint will become heavier in color and coarser in texture as the distance between brush is lessened, and that the tint will be thinner and finer in texture (covering a larger area) as the distance is increased. Similarly, where the distance is maintained uniformly during the stroke, the tint will be thinner or heavier as the speed of the stroke is quickened or slowed down. Evenness or uniformity of tint is secured by uniformity in speed of stroke or movement and in working distance. As a consequence, if the stroke is started with the brush at five inches distance from the sheet and the speed of the stroke and distance are gradually increased, we will get a tint gradually increasing in width but decreasing in density of color as the end of the stroke is approached. Graduated tints, however, are usually made by first securing an even tint over the whole area, and then superimposing

successive horizontal or vertical strokes. Always remember that the brush must be in motion before the air and color flow is started. In tinting an outlined space, for example, begin the brush movement outside the outline, bring it to the proper working distance at the outline and gradually start air and color as near the line as may be, keeping up an even flow of color and uniform speed of movement throughout until near the end of the stroke, when the pressure of the finger on the distributing lever is gradually relaxed so that the tint fades out rather than ends abruptly in a rough or heavy fringe of color.

Fourth Lesson. This may cover the making of tints with even, smoothly defined outlines and of any desired form or shape, such as a rectangular panel in tint on a white ground, or a tinted circle behind the head in a sketch portrait on a white ground. This is done with a mask or form, cut out of heavy cardboard or matt celluloid. For example: cut out a mask having an opening 4 x 6 inches, with an ample margin of card on every side to protect the practice sheet. See that the edges of the cut-out are cleanly and smoothly cut. Fix this mask over the practice sheet with pushpins so that its inner edges fit closely to the sheet. Now, holding the brush at, say, 15 inches from the sheet, blow on an even tint with steady strokes across the cut-out at an angle of 45 degrees. See that each succeeding stroke slightly overlaps the one it follows. If the tint is not sufficiently heavy, begin again at the top at a working distance of, say, 10 inches from the sheet and work with a reversed angular stroke.

To produce a graduated tint from top to bottom, begin at the top of the sheet after laying an even tint, and cross and recross the opening of the cut-out, gradually decreasing the distance between brush and paper as you approach the bottom of the opening. If the graduated tint is to run from side to side, use vertical strokes up and down the opening—in all cases beginning and ending the stroke beyond the actual edges of the cut-out, i. e. on the margins of the mask.

For a circular tint, cleanly cut a circular opening of the size desired from a piece of heavy cardboard and

fix the mask on the practice sheet with pushpins. Set the brush for a line to ensure an even flow of color. Work the brush at 10 inches from the sheet, with a free, swinging movement, crossing and recrossing the cut-out at an angle of 45 degrees with an increasing movement of the brush, but starting and stopping the color flow as the stroke crosses the edges of the cut-out. To increase the depth of the tint from the circumference to the center of the circle, make strokes parallel with the outline of the circle and gradually decrease the distance between brush and sheet as you approach the center portion of the circle. A clean, evenly graduated tint here depends upon maintaining a free but steady motion of the brush, an even flow of color, and a nice regulation of the working distance.

It will be obvious that the form or shape of a tint can be infinitely varied by the use of differently shaped cut-outs or masks. Thus the pointed tints seen in the vignetted backgrounds of sketch portraits are made by the use of cardboard or celluloid forms with sharply pointed zig-zag edges of uneven outline. "Cloud-forms," also used in sketch portraits on a white ground, are usually made by roughly tearing pieces of white blotting paper to an approximate cloud shape and using these as forms. Tint panels with shaded, beveled edges, similarly used, are made by first blowing on an even tint over the panel space and then, after protecting or masking all the face of the tint except the small margins which are to form the beveled edges, blowing in a slightly heavier tint over the unprotected marginal space, darkening the corners and outlining the edge of the bevel with a sharply-pointed rubber eraser and ruler. In other instances only two sides of a rectangular panel may be shown, with a graduated tint running from the angle formed by the two sides of the panel, and so on.

Finishing Prints. Having by means of this or any similar series of practice lessons acquired a working familiarity with the air brush and the principles of its operation, so that he can produce, at will, a fine soft line or spot, a broad wash or tint, graduated or perfectly even in depth of color, within a prescribed area, the

reader may now take up the actual finishing of photographic prints. Spoiled or "waste" enlargements, if not too heavily printed, offer the best sort of practice material, and sepia-toned prints are preferable to black and white.

Preparing the Print. We are now to work on a photographic print, i. e. a print on paper sized or having a gelatinous surface, which has been more or less handled, and so may be somewhat "greasy" or repellent of liquid color. The first step, therefore, is to prepare the surface of the print so that it will "take" the color. This can be done by rubbing it over, carefully and with a light hand, with powdered pumice; or with a wad of absorbent cotton, cheese cloth or fine sponge wetted with weak ammonia solution, such as household ammonia diluted with an equal bulk of water. A mixture of equal parts of denatured alcohol and water or a weak solution of ox-gall will serve the same purpose.

Spotting. Before beginning work with the air brush, the print should be carefully spotted. Small white spots, hair lines, etc., are best removed with a finely pointed carbon (HH., H or HB) pencil, the rougher surfaced papers requiring the softer grades. Larger spots or patches are evened up with a camel's hair brush charged with color matching that part of the print worked upon. Dark spots, unsightly creases in a dress, obtrusive twigs or details in an outdoor scene and the like, are removed or softened with an etching knife; not by violently picking them out so as to leave a white spot needing spotting, but by lightly scraping them down until they match the color of the surrounding part of the print. Use a light touch in this sort of work, and see that the etching tool has a shaving edge in perfect condition, so as to avoid breaking or roughening the surface of the print. Practice makes perfect.

"Finishing" in Monochrome. Let us suppose the subject in hand to be an enlarged portrait: a sepia toned print, prepared and spotted as detailed above. The air brush is ready for use with a supply of colors suited to the color of the print on the easel. First step back from the easel and give the print a careful scrutiny. See just what work is needed for its "finishing" or

improvement, the faults in the lighting to be remedied, weak patches of tone or color to be evened up and so on. Note well the natural modeling of the features and head, which shadows can be strengthened with advantage; where harsh lighting needs to be modified and softly blended into the shadows to give pleasing projection to the features, or where details can be sharpened for the betterment of the portrait. Observe what is needed to improve the hair or draperies; the former may be somewhat wiry or formless in character, the latter may be badly creased or show hard angular lines. Note also the shortcomings of the outline or contour of the head and figure against the background. This may need firmness or softening here and there; parts of accessories, such as the back of a chair, the base line of the ground and so on may need to be subordinated. In short, size up the work to be done before you begin. Broadly speaking, the finishing of an enlarged portrait comprises: building up the tone values, rounding out the modeling, softening crudities of lighting and texture, subordinating obtrusive details, adding variety of tone and aerial or atmospheric effects in the background or space behind the figure.

The Choice of a Beginning Point is a matter of personal preference. Some workers begin with the background and next work over the figure or bust, finally finishing the head and face of the portrait. Others reverse this procedure. Personally, I prefer to begin with the deepest dark in the print, which may be a portion of the hair, a coat collar or some part of the draperies, so as to get a key for the tone relationships in the subject as a whole. In this scheme, beginning with the deepest shadow, first strengthen the shadows in direct ratio to their strength in the print. Then begin again at the top of the head and model the lights and half-tones into the deeper shadows, gradually working down and around the head and features. The natural projection of the head and features must be kept in mind. If the hair is seen to be wiry in character and harshly outlined against the ground, use the brush with a sweeping curved movement to soften the wiriness and bring it into pleasing masses as a sculptor does.

The working distance of the brush will vary, momentarily, from six to ten inches away from the work, as you pass from shadows to half-lights. Be careful not to obliterate the reflected lights which give life to the hair; often they may be accentuated with advantage, this being best done with a bluntly pointed eraser when the worked-up print is thoroughly dry.

The Face. Use a light spray in working the delicate shadows joining the hair and face. Set the line adjustment screw for a fine line and work at about ten or twelve inches away, modeling the thin shadows of the forehead, temples, the junction of the nose with the forehead, the recessed portions of the face under the eyebrows, around the wings of the nose, between the cheekbone and the ear and so on. The motion of the brush should generally conform to the shape of the feature worked on, and the distance of the brush tip from the work will vary from moment to moment according to the depth of color desired at different points. The halftones and delicate lights which run along the borders of shadows should be handled with extreme care. They have much to do with the modeling and must always be preserved. Avoid harsh edges or abrupt shadows everywhere.

The Eyes call for the most careful treatment. As the pupils are usually somewhat contracted by the strong light of the studio (whether daylight, electric or flash-light), their size may generally be very slightly increased with advantage in the portrait. The pupil, except in rare instances, will generally need darkening. Where it is enlarged, as suggested, the edge should be soft and not quite as dark as the central portion. Softness of outline helps to convey the sense of roundness. The high light, when double, should be corrected to a single angular or rectangular shape according to the direction of the lighting and, generally speaking, heightened in tone. Beware of the hard glitter, however, which gives a startling effect. The lightest portion of the iris comes directly opposite the highlight of the eye, shading away into the shadow of the upper lid. Strengthen the shadow running under the upper lid and eyelashes, and slightly emphasize the delicate shadows at either

end of the lid to give it desirable roundness. The corner of the eye near the nose will usually need modeling to bring back its natural form. This corner is lower and shows a small gland which catches the light, this extending along the top of the lower eyelid. Do not obliterate the tiny shadow beneath the edge of the lower eyelid under the eyeball.

The Lower Part of the Face. In treating the nose, mouth, chin and neck the shadows and reflected lights are of chief importance. There is a continual variation of surface in this part of the head, and likeness is largely dependent on the shape and intensity of the modeling of these features. It is better to do too little than to overdo, the natural form being easily lost in the attempt to smooth and finish. The shadow under the tip of the nose, around the nose wings, at the ends of the mouth, under the lower lip and beneath the chin, as well as the play of light along the upper lip and the illumination of the lower lip, call for skillful handling.

The "Finished" Print. It is not to be expected that the first few portraits finished in monochrome with the air brush, as here described, will be wholly satisfactory or approach the standard of quality required in work to be delivered. Without a doubt the beginner will see the need of going back to his progressive lessons and practice sheets to get a surer skill in the handling of the brush, and to making "studies" of the head, eyes, ears, mouth and other features of the face to get a better understanding of drawing and modeling in portraiture. But his first attempts, however poor, will prove conclusively that the air brush will give him desirable results more easily (with less laborious effort) than the old-style hand-brush method of finishing, and so encourage him to go on. Skill will come by practice.

Gum Water. Perhaps the most unsatisfactory detail in the beginner's work will be an uneven, mottled appearance in the surface finish of his portraits. This can easily be removed, and the print "pulled together" and improved, by spraying the print with thin gum water, i. e. a solution of gum arabic of the consistency of thin milk. After this has thoroughly dried and hardened, spray the whole of the print lightly with

water. This is the method generally adopted by air brush 'finishers' and is especially desirable when prints are to be copied or reproduced.

"Finishing" Prints in Color. Much of what has been said of finishing prints in monochrome applies to the finishing or working-up of prints in color. The big difference lies in the fact that we are working with colors, and the prime essential is a good, general knowledge of color and coloring, such as is required in water color painting or working with colored crayons. This, however, lies beyond the scope of our adventure here, and I will content myself with a few hints on the practice peculiar to the use of colors with the air brush.

For prints to be colored a light, sepia-toned print is generally preferred as having a desirable warmth of color in the shadows and darker tones. But if the portrait is done in a high key, i. e. in two or three of the higher tones of white and gray, then a light "black and white" development, bromide or platinum print will serve the purpose. Skillful air-brush colorists demand a much under-printed portrait as the most suitable base, but the beginner should choose a print soft in contrasts but fully detailed in its modeling, as calling for less work and skill in finishing. Prints for air-brush finishing should be flat mounted with paste or starch; a dry-mounted print will sometimes loosen and "cockle" under the repeated applications of a liquid spray.

The Cardinal Rule in Coloring, as indeed in monochrome finishing, is to avoid overdoing; to suggest color rather than to put it on too thickly. Too little color is much better than too much. Use thin, transparent washes and repeat strokes, getting depth of color and shading by superposing one wash of color over another, working as far away from the print as is consistent with the area worked on. Do not attempt to put all the color needed in any part in one stroke or wash.

Groups of the most desirable colors for air-brush work have already been given. Learn from the beginning to work with as few colors as possible, making your combinations and shades by superposing one color over another on the print. The study of a manual on color

mixing and color harmony, such as the handbooks of Prang, Sanford and Hatt will prove very helpful at this stage.

The Vital Point is to maintain the natural relief and projection of the subject, so that the portrait will present a living person rather than a mask of colors. In this endeavor the differences of hue or color contrasts at different parts of the subject offer difficulties not encountered in handling the simpler luminosity contrasts of monochrome work. A cultivated color sense is needed, but in addition to this the worker must cultivate a sense for values, as success in this sort of work depends very largely on keeping the values and planes of the head and features in correct relationship—as they are usually found in a portrait made with a lens of ample focal length. In this a broad treatment of the portrait as a whole, by which is meant the avoidance of “niggling” or working overmuch on individual parts, is the best line to follow. Work well back from the easel; observe the relationship of the planes and values of the parts making up the whole; visualize the finished result as you work, looking at the print with half closed eyes from time to time, so as to see it in masses and planes rather than in detail.

Roughing-in. The first step, knowing the dominant color of the subject (i. e. a child with yellow hair and blue dress, a lady in fancy costume, or an old man or woman in black, with white hair), is to loosely rough-in the background, the hair and any strongly colored parts of the dress, with washes of strong ground color. No attempt is made at this stage to finish the background or any part, but simply to get the key for the general coloring, and to lay in a ground behind the head or figure which will give the effect of viewing it against the vaguely illuminated corner of a room. This will help materially in keeping the natural relief and projection of the head and figure. The choice of colors for the background will vary according to the subject and its general coloration. Brown or brownish-green with touches of dull red near the figure, bluish-purple or lavender-grey with faint touches of pinkish-grey are suggestive. In this roughing-in remember that blues

and greys give the effect of distance and are cold colors, so that the planes recede, while the warm colors by their greater luminosity cause the planes to approach. Strive for variety of tones or planes of color in the background, with more depth of tone near the draperies or contour of the figure and on the illuminated side of the head, opposing the lights and darks in the subject by this variation of tone. Sometimes the contrasting of a highly colored complexion by a luminous color of different hue behind the head will produce a desirable effect. Evenness of tone and "tightness" resulting from a too smooth finishing of the background should be avoided as making for monotony and robbing the delicate colorings of the features of their charm.

The Face. Having roughed-in the portrait generally, as described, the face (and hands, if these are shown) are given a wash of flesh tint or light yellow red. The color used will vary with the complexion of the subject, and the print in hand—whether very light or dark in tone. Care must be exercised to avoid too heavy a deposit of color on the highlights. A thin wash of vermilion may be used with dark, ruddy complexions, and with old people the use of Venetian red, tempered with vermilion, is sometimes advisable. Now remove the flesh color from the color cup, cleanse the brush with water and take a small quantity of Alizarin scarlet or Indian red. In some instances the latter may be modified with burnt umber with advantage. This is now carefully applied in the deeper shades of the face, tinting the cheeks lightly, giving color to the lips, the shadow under the lower lip, chin, the wings of the nostrils, the lobes of the ears, the shadow under the lower eyelids and so on. In portraits of children the coloring of the cheeks may be a combination of Alizarin red and vermilion, keeping the vermilion and a touch of yellow near the highlights on the cheek bones and rounded tip of chin and nose, as well as the lower lip, and a touch of bright scarlet at the inner corners of the eyes, etc. Again cleanse the brush and take Prussian blue. A very light application of this is given to soften the joining of the hair and face, around the outline of the cheeks and neck and over the half-lights—under

the eyebrows, at the temples, on the lower lip and under the chin, blending the lights and deeper shadows with a pearly-grey. In the case of brunettes a few touches of blue, purple or green will enliven the half-lights of the hair, but the shadows should be lightened with yellow and generally kept warm in color. With this class of subject green is a useful color. While the brush is charged with blue or green, apply these to the background or draperies where advantage may so be gained. Thus blue over a brownish-green ground around the upper half of the head will generally heighten the atmospheric effect in the ground of the portrait.

The eyes must be colored, with a small camel's hair brush, to suit the color of the subject. All the form and modeling of the eyes, however, are handled with the air brush. For light yellow hair brown madder or raw sienna are used; a golden brown tone with greys and yellow running through being very effective. Auburn hair calls for burnt sienna, and dark hair, brown or black, is best obtained with sepia and black in combination. Before leaving the face a touch of Alizarin scarlet on the bridge of the nose, in the shadows of the nostrils and at the corners of the mouth should be added with a small camel's hair brush.

Draperies. The colors used will be determined by the instructions in hand. Do not over color. Simply suggest the coloring over the natural textures and modeling of the photographic base. Use softly contrasting tints and avoid raw colors in sharp opposition. Neutral tint is especially useful in mixing these soft colors. Blue and gray are used in the fine shadows of laces and white draperies, the highlights needing a touch of yellow. Use white very sparingly. Prussian blue is generally useful for light blue draperies, a touch of green helping the shadows, tempered with neutral tint. Indigo and black are combined for navy blue and a touch of purple will give life to the shadows. Gold jewelry is colored with hand brush touches of chrome yellow in the lights and burnt sienna in the shadows. Pearls should have a touch of yellow near the highest light and blue in the shadows. A rich, lustrous black is gained by a wash of pure sepia over lampblack.

In changing from the use of one color to another, always put a color cup filled with water on the brush before putting on the new color cup, and thoroughly cleanse the brush. Remove the color from the color cup after use by means of a fountain pen filler and replace the unused portion in the storage bottle for that color. Few changes of color will be needed when the worker gets acquainted with the mixing or combining colors on the print by superposing a wash of one color over another. The expert air-brush colorist also applies the individual colors over all the parts of the print needing them while he is using them and so, in practice, works over the whole print all the time after the first roughing-in has been completed. In this plan, by superposing washes of different colors to secure the desired tones and shades, the whole portrait is gradually "pulled together" in its proper coloring.

Commercial Work. The instructions thus far given have concerned only practice lessons and the finishing of enlarged portraits in monochrome and colors, because the photographer is already familiar with the general handling of this class of work and it therefore offers the simplest way of acquiring a practical knowledge of air-brush manipulation and technique. As skill in this comes by persistent practice the varied usefulness of the air brush as a finishing tool will be more and more appreciated and it can be applied in other and different uses. For example, we may have an order in hand for a series of commercial views of an industrial plant, e. g. a group of buildings. As printed by projection from small negatives, these may exhibit certain shortcomings, such as baldheaded skies, uninteresting foregrounds or obtrusive details, excessive contrasts of color or tone and so on. Such work can be improved one hundred per cent before delivery by the discriminating use of the air brush.

A Practical Example. Let us suppose the prints to be 14 x 17, in black and white. First prepare four color mixtures. Take four 2-oz. bottles. In No. 1 put a good grade of white such as blanc d'argent and sufficient water to give it the consistency of thin cream, but not too thick to go through the air brush quite freely. In

bottle No. 2 put lampblack and white in such proportions as to give a smooth, light grey mixture. In bottle No. 3 make a color mixture somewhat darker than No. 2, and in bottle No. 4 a mixture still darker than No. 3 but not decidedly black. A little azure-cobalt or sepia may be added in mixing Nos. 2, 3 and 4 if necessary to match the bluish-black or brownish-black color of the prints to be worked on.

The surface of the prints to be finished should be prepared by gently rubbing over with any of the solutions mentioned on page 20. If the sky portion of the prints needs treatment, first cut out a cardboard mask to follow and cover the general skyline of the buildings in the view, and fix this over the print. Now roughly tear a few pieces of blotting paper to approximate shapes resembling cloud forms. These, in use, are fixed in the tip of a retouching pencil holder or crayon holder and held in the left hand at a distance of about a quarter of an inch from the sky part of the print. Put a little of mixture No. 2 or No. 3 in the color cup of the brush and adjust the air pressure to about fifteen pounds. Bring the air brush over the sky at the left margin and, at a working distance of two or three inches, begin to cross the sky with an irregular undulatory motion over the top of the cloud form, the left hand holding this and traveling over the sky with the brush motion. A demonstration of this would be better than pages of description; but the idea is to spray cloud forms irregular in outline and shape and varying in depth of tone over the upper portion of the sky space, the lower portion being protected by the cloud templet. The motion of the air brush as it travels across the skyspace will or should be varied in speed and the distance between brush and print should also be varied from moment to moment to give variety of tone. When skillfully done the result will be the representation of soft, indefinite but pleasing cloud masses, effectually breaking up the monotony of the plain sky of the original print. This "clouding" may well form a practice lesson in itself, using a white card evenly tinted as a practice sheet, and will well repay all the time you give it. After clouding the upper portion of the sky as indicated,

clean the brush and, with mixture No. 1 spray a light tint close down to the skyline of the buildings. If this results in the running over of the white upon the buildings, remove the "run-over" with a bluntly pointed eraser.

The Clouding of Backgrounds in small prints, as in sketch portraits with white grounds, is done in the manner here described, varying the form of the templet according to the effect desired. Of course the work on small prints calls for more care in the handling of the brush. The templates used in this small work are sometimes miniature cloud shapes and at other times zig-zag or angular shapes, according to the effect desired. In making the latter, celluloid or thin, hard Bristol board is better than blotting paper as giving a more definite edge, which is desirable. The zig-zag lines or angular forms should always have the same general direction, i. e. should not seem to radiate or spread in fan shape from the head or figure. The small cloud forms and templates, when made of paper, are usually provided with a turned-up edge convenient for gripping between forefinger and thumb of the left hand or inserting in a pencil or charcoal holder when in use.

Working in a Background where a single figure or head is to be copied or enlarged from a group is done as follows. If the original print may be destroyed work directly upon it, otherwise make a slightly enlarged copy and work on that. Glossy development paper will give the best copy print for after reproduction. Mount the print with paste or starch and clean the surface thoroughly with weak ammonia water. Procure a sheet or two of frisket paper and a small supply of rubber cement of good quality. Apply the cement to all the portions of the portrait (head, face, etc.) which are to be protected from air-brush work and lay a piece of the frisket paper (a thin, transparent mask paper) over the cemented parts. Rub the paper down until it adheres perfectly. Take a sharp-edged knife or safety razor blade and cut carefully and gently through the frisket mask all around the hair, head and figure to be protected. Remove all the paper except that covering the figure—by peeling, and carefully rub off the

cement at the edges of the mask and on the whole of the print outside the protected parts. The cement will readily peel under the application of the finger tips. When thoroughly cleared of any trace of cement the print will now "take" the air-brush work perfectly. Now take mixture No. 3 or No. 4, according to the general tone of the ground suited to the subject in hand and lay an even tint over the whole of the background of the figure. This done and thoroughly dry, take mixture No. 2 or No. 3, as may be appropriate, and with a circular or wavy motion and the use of cloud forms, lay a loose, uneven tint over the ground already worked in the background. The general scheme of the background, whether clouded or varied in tone by differing depths of shading in parts, may be left to the choice of the worker. A little practice on these lines will quickly give the desired facility in working in grounds well adapted for copying and useful in other branches of reproduction work, photographs of commercial articles such as machinery, automobiles and the like. The introduction of designed grounds for combination groups and commercial work (as the skillful combination of an automobile pasted on a landscape or street scene in correct position and perspective for advertising purposes) is done by this method. The color or tone of the mixtures used should, of course, match the tone or color of the copy print as closely as possible. When all the air-brush work needed has been done, insert a thin knife blade under the frisket mask covering the head or figure and peel it away quietly and with care. Allow the cement covering the protected part to dry a few moments and then rub it off cleanly with the finger tips. If the work has been carefully and well carried through, you will now have the figure or subject to be copied isolated and attractively set against a suitable background and the final copies may be made in any desired size.

Frisket Paper and Masks. The use of frisket paper, supplied by any air brush manufacturer, is very simple when once the way of applying and removing it has been acquired by experimental practice on waste prints. But it is used only where it is desired to work right up

to the outline of a subject for finishing or copying. Otherwise a card, celluloid, paper mask or form, of the required shape or curve, is generally used to protect the parts not to be worked on.

Matching Combined or Pasted Prints. When prints are combined by pasting, as when a single cut-out figure is added to a group, or a cut-out automobile pasted on to a roadway scene, the hard, white edge of the cut-out is blended as follows. Take black or sepia crayon sauce of the same color as the print and a flat bristle brush about one-quarter or three-eighths of an inch wide. Charge the brush well with the crayon sauce and try it on a smooth card to ensure freedom from grit or lumps. Then vigorously brush the white edges of the cut-out until its whiteness completely disappears. Now take a sharply pointed rubber and stipple any over-dark portions apparent along the outlines of the cut-out. Finally spray with the air brush charged with a suitable color, finishing with a light spray of gum water over the whole print.

Matching Uneven Portions of Prints. It will often happen that enlarged prints, whether of portraits or commercial subjects, will show large portions of uneven color or tone. For example: sometimes portions of drapery in a figure will be too light in tone; or a white dress may lack detail; or the sleeve or lower front of a man's coat may be weak in tone or formless. The air brush, charged with mixtures 2, 3, or 4 (see page 29) as the case may require, will remedy these effects. This sort of work is best learned by practice on a few waste prints exhibiting the defects mentioned. By working with lampblack or sepia, the work done may be washed off with water if unsatisfactory and the coloring or shading repeated as often as may be needed until the desired skill or finished result is obtained. The effectiveness of this use of the air brush depends upon the skill of the worker in producing the desired result with as little color and work as possible. Avoid loading the print with color and making the brush work too obvious. Use a light spray, setting the brush for a line and working as far away as is practical.

In the same manner all sorts of obtrusive details in

a print, whether of actual objects or objectionable faults of lighting, reflections in interiors, spotty outdoor backgrounds and the like, can be softened or subdued in tone or removed altogether. Hand masks of different shapes and sizes, the outlines of which offer every variety of long and short curves, angles and lines, are much used in this class of print improvement. Not always must the mask be cemented to the print, save in working elaborate changes in a large print to be afterwards rephotographed to a required size. Generally it will suffice to hold the mask or templet close to the print in the left hand, moving it as the work proceeds.

The Air Brush in Pictorial Photography. Convincing proof that the air brush is an art tool rather than a mechanical brush is seen in its intelligent use in pictorial photography, whether this be followed according to the methods of earlier days by combining parts of several negatives to form the final print (as in the work of H. P. Robinson, A. Horsley Hinton and A. R. McNaughton), or employing the soft, diffused effects in vogue today. In either method the best effects are obtained by working upon an enlarged print or negative and then rephotographing this down to the desired size, using a rough surface paper for the production of the final prints. The Kilmer method of making the enlargement negative on a development paper such as Artura Iris, given in *Studio Light*, October, 1920, is well adapted for making large negatives for air-brush work and printing by reduction.

The actual manipulation of the print in such a case will vary according to the taste and skill of the pictorialist, who alone knows what is wanted by way of addition, elimination, subordination or accentuation in the subject before him. Thus skies may be introduced or improved; uninteresting masses given variety of tone or detail; obtrusive details softened or eliminated, weak portions strengthened and additions (printed in or pasted on) blended and harmonized with their surrounding parts. The most perfect work of this sort is done by making an enlarged transparency of the original on glass and working on this with the air brush and

transparent dyes, opaques etc. From this worked transparency a negative is made by reduction to any size desired and the final prints made from this on a rough paper surface.

Always, before beginning air brush work on a bromide print, clean the surface by lightly rubbing it over with wood alcohol or one of the mixtures given on page 20, in order to ensure a grease-free, working surface. In the case of large prints finished with the air brush, a coat of artist's fixative (1 ounce of best white shellac dissolved in 7 ounces denatured or wood alcohol, the clear portion being decanted after the mixture has been well shaken frequently and allowed to stand for a day or two), should be applied to the whole print, which should then be vigorously rubbed with a tuft of cotton wetted with waxing compound. It is better to apply this fixative with an artist's fixative sprayer, and so avoid the troublesome cleaning of the air brush with alcohol necessary after the use of a shellac varnish. In some instances the air-brushed print can be improved, before applying the shellac, by picking out the highlights or brightening them with a sharply pointed rubber eraser. But don't overdo this or the result will be a spotty print.

Air Brush Work on Negatives. When by persistent practice on paper and photographic prints, the photographer has gained a practical knowledge of air brush manipulation, he can profitably begin to use the air brush in retouching and improving negatives. The special difficulties in this work are the application of liquid colors to a non-absorptive surface such as the glass side of a negative or upon a gelatine film or ground glass varnish, and the use of transparent colors, dyes and opaques for their light-resisting effects.

Preparing the Surface. If the work is to be done on the glass side of the negative, it is imperative that this shall be thoroughly clean. This is best done with a tuft of cotton or soft rag wetted with a strong soda or ammonia water solution, finishing with wood alcohol. Hard spots of emulsion or gelatine should first be scraped off with a knife blade. Perfect cleanliness of the glass surface being assured, the negative should be kept

moderately warm while being worked on, so that the color spray will dry as fast as applied, and a very fine, light spray is employed. Any unsatisfactory work done on the glass side of the negative can, of course, be removed instantly with a tuft of cotton and water, it being presumed that the colors used will not be of the waterproof kind. If the work is to be done on the gelatine film side of the negative or, as is often recommended, on a separate piece of flat film or celluloid which is placed as a screen in front of the negative during printing, i. e. in contact with the glass side (with the object of softening the definition of the air-brush work), the gelatine film is first cleaned with a tuft of cotton wetted with alcohol to ensure a surface free from grease or color-repelling patches. Work on such a film surface cannot be removed completely by washing when dyes are employed, but small defects, spots of heavy color, etc., both on film and glass, can be softened or picked out with a sharp pointed rubber eraser or stomp and cuttle-fish powder. Ground glass varnish, used as a base for air-brush work on negatives, should be of a good, fine-grained quality and carefully applied to secure a thin, even film. Let it thoroughly harden and keep the negative slightly warm while working on it, avoiding repeated strokes on any particular portion of the plate until the previous color deposit is thoroughly dry. In the case of mistakes on a ground-glass base the whole of the varnish must be removed, save in exceptional instances where the skillful use of an etching knife will remedy the error.

The Colors used for negative work are transparent yellow, orange and red or aniline dyes of these hues, a thoroughly mixed, fluid white and finely ground photographic opaque or draughtsman's india ink. The last three should be filtered through fine muslin to ensure freedom from grit, and the bottle containing the liquid white should have a few small lead shot or small pieces of lead in it so that, when well shaken, a smooth mixture free from lumps will be secured.

Method of Use. The negative to be air brushed is placed on a retouching easel or desk, with sufficient reflected light coming through it to enable the operator

to see the effect of his work at every point—as in retouching with a pencil. Small masks of suitable form, held in the left hand or lightly held on the negative over any parts to be protected, are used as necessity indicates. The color cup on the brush is filled with the color, dye or liquid opaque to be used. This should be of the consistency of ink. The brush is set for a line and the air pressure should not exceed fifteen or twenty pounds as giving better control of the color. If there is any tendency to spluttering of color or unevenness of deposit, remove the color cup, fill a clean cup with water and thoroughly cleanse the brush at a pressure of twenty-five pounds.

Thin portions of negatives which print too quickly, thin skies or foregrounds, a mass of trees or a dark doorway in an interior and so on can be held back (intensified as to printing density) with a few strokes of the brush charged with yellow. Details requiring more density or cloud forms in skies may be strengthened with orange. Portions which should be rendered very light in tone or eliminated are treated with red or opaque. The use of liquid white for skies, in place of yellow dye or opaque, is favored by some workers as giving more delicate shadings of tone or density. The choice of the dye or color used must be left to the worker's practical knowledge of their density giving capacities. Of course, they may be diluted to any desired strength, which will vary according to the density of the negative being worked upon. The object always should be to get the required density or result required in as few strokes as possible, without repetition, to avoid softening or deterioration of the ground glass or gelatine film surfaces. In portrait work the mask used to protect any portion of the figure is usually made by cutting out a collodion paper print or traced design on plain paper. A gelatine paper print, if used as a mask, is liable to get dampened and adhere to the negative. To the operator with a little facility all the air-brush work required by the average negative, such as strengthening the shadows, laying-in a tint over an unexposed portion or brightening up a weak sky, can be done in a few minutes. This facility cannot be

had by any amount of book reading, but only by practice on the negative itself along the lines here indicated.

Putting in Backgrounds with the air brush, by which is meant working a background of definite design into a portrait negative having a transparent ground behind the figure, is quite practicable, but involves a knowledge of drawing and perspective and is, at best, somewhat tedious and difficult in the doing. Generally, too, the results are of questionable worth. The difficulties can be minimized by confining the effort to introducing a mere suggestion of form or design, rather than attempting (as is too often done) to work in the traditional studio ground catalogued as a "Reynolds" or "Gainsborough," with unsubstantial pillars and draperies in the foreground and a "Corot landscape" in the distance. I recall the instance of a prominent New York photographer, specializing in home portraiture, who made successful, because restrained, use of the method when he was obliged to photograph his subjects against a mass of incongruous wall or room decoration. But he has since abandoned it as undesirable because of its artificiality.

The Method of working-in such a ground by the old hand procedure was described and illustrated in *THE PHOTO-MINIATURE* No 126, now out of print. In using the air brush for the work, there is the same need of a predetermined design and suitable forms for the introduction of the details of the design, such as pillars, windows, or similar features. The "color" used will generally be one or other of the mixtures 2, 3, or 4 (page 29) as required by the design and the character of the negative worked on.

It is, however, very desirable that the beginner should first practice this background painting with white on 8 x 10 sheets of smooth black paper such as is used for wrapping plates and sensitized papers, so that he may acquire a correct sense of the values of light and shade reversed as they are in a negative.

Here would be the procedure for a background having two massive marble pillars on a rectangular base in the foreground, with a heavy curtain draped

over the left hand and upper corner (this combination occupying the left-hand third of the space). Beyond the pillars we see a rolling landscape with trees and a well-clouded sky filling the other two-thirds of the picture space.

Mount an 8 x 10 sheet of black paper and fix it on the easel board. Fix a cardboard form cut to the size and outline of the curtained pillars over the left-hand third of the practice sheet. Now, with white water color in the color cup, the brush set to a line and the air pressure at twenty pounds, lay in the highest light where you have previously sketched the horizon in the landscape to begin. Work over to the right indicating the tree forms and light of the sky between the branches. Now work in the whole of the sky with varying depths of color and the suggestion of cloud forms. Lay in the foreground with light strokes, barely covering the black tone of the paper, but indicating a pathway leading into the center of the lower half of the picture. Remove the form protecting the space reserved for the pillars and curtains, run a broad light down the center of the pillars, shading this off gradually to their outlines to give them roundness and relief. Put in the highlights and half-lights indicating the outlines, mouldings, paneling and markings of the marble base, using the straight edge of your mask or form for the lines of the base. Now place the lights and half-lights on the curtain until it hangs properly with the feeling and texture of drapery, and your ground is complete. If the edge of the pillar against the sky is too hard, a few up and down strokes with the brush at three or four inches away will soften the edge and help it to fall into place. The abomination is now complete.

Without a doubt the first attempts of the untrained man at this kind of work will be crude in result. But persistent practice will mend matters and in a little while you will get "the hang of it," so that you can begin work on a negative with confidence in your ability to produce reasonably good work.

Coating Gum Bichromate Papers. Until I looked into the books a few months ago, I had imagined that the credit for first suggesting and using the air brush for

the coating of gum bichromate papers was due to the late Walter Zimmerman, who described his method in *THE PHOTO-MINIATURE*: No. 113 (October, 1910). Zimmerman, however, was anticipated by H. E. Blackburn who, in the April, 1908 issue of *Camera Craft* asserts his preference for the air brush for this method of preparing "gum" papers, as superior to the old-style brush coating. Long before either Blackburn or Zimmerman, the veteran photographer W. H. Sherman patented in 1885 a method of producing photographs in permanent pigments in which the gelatinous pigment mixture was blown "upon the paper to be coated by means of a physician's atomizer, operated by a continuous stream of compressed air supplied from an air pump or it may be applied by means of an air brush." The "air brush" here mentioned must have been an early form of the Walkup brush which, in its present design, was patented in 1885-86. Blackburn and Zimmerman used the Wold Air Brush—apparently a model generally employed for the spraying of oil colors or fairly thick liquids.

The Method. There is no special trick in the use of the air brush for coating gum pigment papers, except that the gum solution should be perfectly smooth, free from lumps or grit and not too thick or heavy. As matter of course, the gum-pigment mixture should be thoroughly filtered through muslin before using in an air brush. The paper for coating by air brush is preferably fixed vertically against a wall or board larger than the sheet to be coated. As a time-saving convenience Zimmerman advises that paper should be coated in full-size sheets and not in small pieces cut to size for use. Begin the coating by a steady, continuous movement of the brush across the sheet, using at first a very light air pressure which may later be increased, and holding the brush about a foot away from the paper. As soon as the whole sheet has been coated in one continuous movement, repeat the coating but this time work from left to right, up and down the sheet from top to bottom.

After the Use of the Air Brush with any thick, gelatinous mixture, the thorough cleansing of the brush

with warm water is an absolute necessity as the gummy mixture, if allowed to dry, will certainly clog the brush and give trouble in after use.

The Advantages of the air brush, as compared with the ordinary hand coating brush, for this purpose are many and obvious. The pigmented color spray thrown on the paper dries almost instantly, so that a coating is ready for use at once, or repeated coatings can be given in a much shorter time than with the old-style brush. The air brush coating, too, is more even and uniform in thickness than the hand brush will give, and the less exposed portions of the picture image wash out more easily in development. This last is particularly advantageous where, as in modern practice, the gum print is developed by simple soaking rather than by brushing or scrubbing. The pigment, to be sure, is embedded in the fibres of the paper, but it is more on the surface than with the old method of coating, so that the lighter portions of the picture are not so liable to be stained or degraded in tint. The air brush coating method is especially advantageous in preparing thin papers, such as onion skin, thin bonds or Japanese tissues for gum printing, wherein hand brush coating gives rise to creases, wrinkles and other difficulties. It is advised, in coating such papers, to use a fairly heavily pigmented solution with a single coating, as obviating the tendency of such papers to shrink, which makes registration difficult in multi-color gum printing.

With this our discussion of the usefulness of the air brush to the photographer draws to its end. Grateful acknowledgment is here made of the practical help and information supplied by Mr. Samuel W. Frazer and Dr. T. O'Connor Sloane in the preparation of the monograph, as well as to the makers of the various air brushes at present available for the loan of blocks illustrating their brushes.

BOOKS

THE AIR BRUSH IN PHOTOGRAPHY. By G. F. Stine. 144 pages, illustrated. 1920. \$3.50.

A TREATISE ON THE AIR BRUSH. By Samuel W. Fraser. 66 pages, illustrated. 1915. \$1.50.

Notes and Comment

TO THE READER. In order to avoid further delay in publication, many interesting "Notes," "Reviews" and "Exhibitions" are omitted from this already over-filled issue of THE PHOTO-MINIATURE. They will be published in the April issue, which I am boldly promising will reach the reader within thirty days after this meets his eye. The irregularity in the publication of the magazine has been a dire distress to all concerned, but was unavoidable in the circumstances. I think, however, that we have reached an end of the difficulties and that THE PHOTO-MINIATURE will be published more frequently and more regularly from this date forward.

U. S. vs. E. K. Co. The withdrawal of the appeal of the Eastman Kodak Co. to the Supreme Court of the United States against the decree of the Federal District Court of New York, handed down in 1915, and its acceptance of the decree, has aroused much curiosity as to the future development of the Company. The subjoined statement issued by the Kodak Co. to the photographic trade is therefore interesting as giving the present status and probable future policy of the Company.

Rochester, Feb. 5, 1921.

Our government suit has been settled. This is to tell you just how it has been settled.

Under the decree which we have accepted, we are to sell certain specified Divisions of our business, in some cases including the factories.

What is known as the Folmer & Schwing-Century Division is to be sold, including the trade names Graflex, Graphic and Century, and also including the factory with all tools and equipment.

Similarly we are to sell the Premo factory and equipment and trade name Premo.

The trade name Artura is to be sold and with it we are to disclose to the purchaser the Artura formula.

We are also to sell the trade names, Seed, Stanley and Standard, and disclose to the purchasers of those trade names the formulæ for those brands of plates.

If an intending purchaser of the disclosure of one of the formulas is desirous of purchasing a factory as well, we are to sell the American Aristo plant at Jamestown at a fair and reasonable price.

By the terms of the settlement, we are to have two years in which to make such sales. If at the end of that time the sales have not been made, the properties are to be put up at auction, but with a minimum price to be agreed upon between the government and ourselves.

Dealers in and users of the products that are affected by this decree will, first of all, be interested as to whether or not they are to continue to receive them without interruption. Of this they can rest assured.

The two camera factories affected will be operated by us to the fullest possible extent until a sale has been made, and similarly, we shall continue to supply Artura Paper and, under their original trade names, such of the brands of Seed, Standard and Stanley plates as we purchased. Certain of the products now marketed under the Seed, Stanley and Standard names were, however, originated in our own factories, were not a part of our purchase from the Seed, Stanley or Standard companies, are not therefore subject to the court order and will, at the earliest possible date, be marketed under new trade names. The most important of these products are the Seed 30 Plate, the Seed Graflex Plate, the Seed Panchromatic Plate, the Seed X-Ray Plates, the Stanley Commercial Plates, the Standard Polychrome Plates, the Standard Post Card Plates and the Standard Lantern Slide Plates.

It is the avowed object of the Sherman law to provide for the widest possible competition. Obviously, then, we are not prohibited from making paper and plates to compete with the brands that we part with. On the other hand, we are expected to compete with them.

This we shall do and in the case of paper and plates, we shall have every facility that we now have, the "Know how," the same plant, and the same men. It will be for the consumer to decide who makes the best goods—those to whom we disclose our formulæ and sell our trade-marks or we ourselves.

So far as the cameras are concerned, the conditions are different. We are to sell factories and machinery and tools and goods in process as well as the trade names. Obviously, we cannot immediately come out with competing lines.

All this will make no difference, however, in the steady flow of goods to you. We intend that the trade and the public shall not be inconvenienced. There will be Graflex and Premo Catalogues and advertising of those lines as in the past.

In many respects, we shall presently be in a better position than ever, to go on with our development of photography. Many elements of doubt and uncertainty are removed. The manufacturing ends of our Kodak Park, our Camera Works (where Kodaks and Brownies are made), and Hawk-Eye plant, where we manufacture lenses, are unaffected. The organization of our sensitized goods department, both manufacturing and selling, remains intact.

The newspaper reports of this settlement of the Government suit may have disturbed you, may have in a measure destroyed your confidence as to the future. You have now had the story straight. We have, because we want you to have the same confidence that we have, told you fully and frankly just what the situation is.

Doubt, uncertainty—they are behind us. We are in a position to serve. You are in a position to join us in the big drive for the development of more business.

EASTMAN KODAK COMPANY.

A BRITISH AMALGAMATION. Seven prominent British photographic and optical firms, viz. The Paget Dry Plate Co. Ltd., Rajar Ltd., Marion and Co. Ltd., Marion and Foulger Ltd., A. Kershaw and Son Ltd., the Kershaw Optical Co. Ltd., and the Rotary Photo-

graphic Co. Ltd., have fused their respective interests by incorporating as Amalgamated Photographic Manufacturers Ltd. The authorized share capital of the new company is stated as £1,100,000 (approximately \$4,400,000) of which 250,000 10 per cent participating cumulative preference shares of £1 each are offered for public subscription. The purpose of the amalgamation is stated to be the more ready development of the foreign and domestic trade of the concerns involved, with the introduction of substantial economies in the manufacture and sale of their products.

F. E. OGDEN, whose many admirable qualities won him a host of friends while he was connected with the Herbert & Huesgen Co., is now in charge of the photographic department of Schoenig & Co., 8 East 42nd Street, New York. An amateur of uncommon skill, Mr. Odgen's specialty of the moment is the production of enlargements which bring out all the pictorial quality his eye can discern in the tiny originals committed to his care.

CIBA. This is a new trade name likely to become familiar among American photographers during the coming years. It is an abbreviation of the title of the Society of Chemical Industry in Basle, Switzerland, one of the largest chemical concerns in Europe, with a manufacturing plant which dominates the city of Basle as the Kodak plant dominates Rochester—by sheer mileage. Ciba Company, Inc., of 91 Barclay Street, New York, the Sales Agents for the Ciba products, is wholly an American Company.

The Ciba specialties thus far announced comprise Metagol, "Ciba" (a chemically pure monomethylparamidophenol sulphate), Diamidophenol "Ciba;" Glycin "Ciba;" Paramidophenol "Ciba;" Hydroquinone "Ciba;" Pyrogalllic Acid "Ciba" (Resublimed)—a complete line of photographic developers for plates, films, lantern slides and papers, with a high reputation abroad for purity and reliability. A descriptive booklet,

with many useful formulas for special developers, combinations of developers, etc., can be had from Ciba Company, Inc., on request.

A NEW SOFT FOCUS LENS, or rather, a new supplementary lens which converts any anastigmat to which it is fitted into a soft focus lens of the most desirable sort, is to be introduced shortly by the Pinkham & Smith Company, 290 Boylston Street, Boston, Mass. I hope to have detailed information about the lens in the forthcoming issue of *THE PHOTO-MINIATURE*.

HEYDE'S ACTINO PHOTO METER. Many readers who have seen this well-known exposure meter (advertised in *THE PHOTO-MINIATURE* and other journals at \$10) offered at various prices ranging from \$5 to \$7.50, have asked for the facts in the case. These are briefly: The Herbert & Huesgen Co., of New York, are the exclusive representatives in America of the German maker of this meter, Gustav Heyde, of Dresden. As such they arranged to place on this market the latest, improved form of the Heyde meter, with an exposure dial calibrated to give the correct exposures in accordance with the lens diaphragm scales universally used on American cameras. The selling price was fixed at \$10, which allowed the importers and trade generally a reasonable profit on its sale. Thereafter someone without ethical scruples proceeded to import a lot of the meters as made for sale and use in Germany, fitted for the Continental diaphragm system which differs from that used in this country. Taking unfair advantage of the demand in this country, created solely by the advertising of the authorized import agents, the aforesaid someone without ethical scruples, is unloading the model made for use in Germany (and hopelessly confusing to users of American cameras) at various "cut prices." It is a bad bargain and the Herbert & Huesgen model, with the American dial and instruction book is more than ever worth its price as the simplest and best solution of the problem of exposure.

Books and Prints

PICTORIAL PHOTOGRAPHY IN AMERICA 1921. 73 pages; 56 plates; 8 x 11 inches; paper boards, \$3. Published by The Pictorial Photographers of America, New York. Obtainable from Tennant and Ward, New York, or dealers generally.

The Pictorial Photographers of America is the title of an association composed of about four hundred amateur and professional photographers scattered throughout many states and Canada, which has for its single purpose the stimulation and encouragement of all interested in the art of photography. The association has its headquarters at the National Arts Club, New York. Its activities are directed by Mr. Clarence H. White, aided by a group of earnest workers who are unsparing in their devotion to the organization and its purpose. These activities comprise regular meetings, with addresses or demonstrations covering a chosen phase of photography; the promotion and routing of exhibitions of pictorial photography in America, and the publication of an annual illustrating and recording the progress of pictorial photography in America. As such the organization seeks and richly deserves the good will and coöperation of all interested in the development of photography.

The volume here briefly noticed is the second annual published by the association, a labor of love on the part of all concerned in its making, and published at the bare cost of production without intention or hope of profit. It is a book of rare and unusual interest for anyone confessing to pictorial aspirations, offering as it does, not only an inspiring exhibition of current American pictorial work, but also some account of how the pictures were made, with an illuminating report on "The Year's Progress" by Clarence H. White, and an uplifting page, headed "Painting With Light," by Arthur Wesley Dow.

To attempt any detailed review here, without the pictures before us, would be futile and unprofitable. As reproductions, the illustrations are the best we have had since Alfred Stieglitz discontinued his amazing "Camera Work." In format, printing and binding, the volume is a delight to the eye.

I note with pleasure that the woolly, smudgy effects resulting from the abuse of the soft-focus lens, so conspicuous in last year's volume, are less in evidence in this. Doubtless this is in part due to better presswork; but I am hopeful that it is also a sign that our American pictorialists are becoming more discriminating in the art of focusing (or shall I say, delineation?), and in the proper use of the lens—whether anastigmat or "soft focus." In their subjects the pictures show a wide variety of interests, with perhaps a preference for the pictorial treatment of architectural detail. The portraits are few in number, unconvincing and lacking in distinction. The outdoor scenes and story-telling pictures still show too much of unrelieved and uninteresting blackness and fog for my fancy, but there are notable exceptions. It would seem as if our pictorialists loved gloom and mystery overmuch, forever setting out on their picture making at eventide. The strongest work in the book is found in the few pictures which show the play of sunlight.

WALL'S DICTIONARY OF PHOTOGRAPHY. Tenth edition, 1920. Edited and largely rewritten by F. J. Mortimer. 700 pages; 2,000 references. Cloth \$5. American Sales Agents: Tennant and Ward, New York.

The appearance of a new and up-to-date edition of this standard reference book will be welcomed by professional and amateur photographers alike. In its comprehensive fullness of detail, as well as in the quality and reliability of its information, Wall's "Dictionary" has always been unequaled among the books of its kind, and its growth from the slender volume published twenty years ago to the present bulky tome of 700 closely printed pages represents the labors of many photographic workers and writers of prominence. It is

essentially a resumé of working processes, methods and formulæ, many of which are dealt with in such completeness that the "Dictionary" belies its name, and might better be described as a library of little handbooks in a single volume. By careful compression and judicious editing, however, Mr. Mortimer has succeeded in covering the whole field of photography within its ample bulk, so that all the information offered by its two thousand items is made instantly accessible. The busy reader, especially, will be grateful for the elaborate system of cross reference introduced in this edition. As the only work of general reference at present available, apart from its merit as the best of its kind, it should find a place on the workroom bookshelf of every photographer.

THE BRITISH JOURNAL ALMANAC, 1921. Diamond Jubilee Issue. Edited by George E. Brown, F. I. C. Paper covers, \$1. Cloth bound \$1.50. London: Greenwood & Co. American Trade Agents: George Murphy, Inc., New York.

Better than ever and more indispensable than ever must be my brief comment on this Jubilee Volume of the "Almanac." Apart from the regular comprehensive digests of the year's methods, formulas and processes, apparatus and whatnot, Editor Brown offers a capital handbook for beginners under the title "More Photography" and, as a new feature, has reformed the Calendar in an amazing way. By all means get a copy—if you can.

FAYETTE J. CLUTE

With a keen sense of personal loss I record the death of Fayette J. Clute, for many years Editor of *Camera Craft*, of San Francisco, which took place January 31st, after a painful illness borne with heroic patience and fortitude. R. I. P.

Imperial Plates

brilliantly reproduce the image in
a particularly fine-grained emul-
sion with abundance of detail.

A Plate for Every Purpose

FLASHLIGHTS

For High-Speed work, adapted to and used by the leading
Newspaper-Photographers of the U. S. A.

SPECIAL SENSITIVE

A fast plate for Portraiture and Focal-Plane work

ORTHOCHROME

For use with a Color-Screen

NON-FILTER

For the true rendering of Color-Values without a color-screen

ORDINARY

Especially adapted to Landscapes and Seascapes

PROCESS

For Black-and-White work

LANTERN (SPECIAL)

The World's Standard Lantern-Plate

We are Agents for the

THAYER & CHANDLER AIR BRUSH

Stock always on hand. Also repair parts and
all sundries for air brush work

G. GENNERT

24-26 E. 13th Street, NEW YORK

320¹/₂ S. Wabash Avenue, CHICAGO

208 S. Spring Street, LOS ANGELES

2102 First Avenue, SEATTLE

53 Fourth Street, SAN FRANCISCO

Kindly mention THE PHOTO-MINIATURE

ANNOUNCEMENT

We have been appointed
the **SOLE AMERICAN AGENTS** for
the Complete Line of

ERNEMANN

**Photographic Apparatus
Motion Picture Cameras
and Accessories**

- ☐ The recent amalgamation of the famous company of F. Krupp, at Essen, with the Ernemann works at Dresden, assures the highest possible development of the firm's photographic manufactures.
- ☐ Catalogues and literature in preparation. Send your name and address for early copy.
- ☐ We carry in stock a full assortment of Ernemann Cameras, in all sizes and models from Vest Pocket to 5 x 7, for roll-films, film packs and plates; fitted with anastigmats, Sector and focal plane shutters.
- ☐ This Agency includes a Service Department available to all owners of Ernemann apparatus. Come to us with your questions or difficulties.

HERBERT & HUESGEN CO.
18 EAST 42ND STREET, NEW YORK

[NEAR FIFTH AVENUE]

The Universal Anastigmat Lens



A lens that has most satisfactorily solved the problem of variety and convenience is the

Bausch^{and} Lomb Protar VIIa

A rapid, convertible lens, composed of two Series VII Anastigmats which may be used singly, making really three lenses in one.

As a doublet, it has sufficient speed for any ordinary instantaneous work, while the two single elements, which may have different focal lengths, are suitable for landscapes, architectural work, groups and the like.

Write for our new photographic lens catalogue, which describes the Protar VIIa as well as other Bausch & Lomb anastigmats and accessories.

Bausch & Lomb Optical Co.

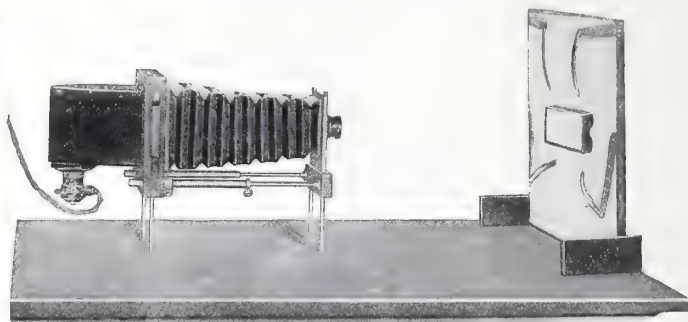
634 St. Paul Street, Rochester, N. Y.

New York Chicago Washington San Francisco London

Leading American Makers of Photographic Lenses, Microscopes, Projection Apparatus (Balopticons), Ophthalmic Lenses and Instruments, Photomicrographic Apparatus, Range Finders and Gun Sights for Army and Navy, Searchlight Reflectors, Stereo-Prism Binoculars, Magnifiers and other High-grade Optical Products.

Kindly mention THE PHOTO-MINIATURE

KODAK ENLARGING OUTFIT



CAMERA, illuminator and easel—everything necessary for practical enlarging—in an outfit compact enough to operate on a table top.

The camera will accept 4x6-inch negatives, or smaller, and large prints may be made to any size that the negatives, themselves, will permit. The easel furnished with the outfit, however, is 14x17 inches.

The outfit includes Enlarging Camera, lens and diaphragm, (largest stop U. S. 4) easel, lamp-housing, light cord and plug, but does not include the 60-watt Mazda electric light bulb.

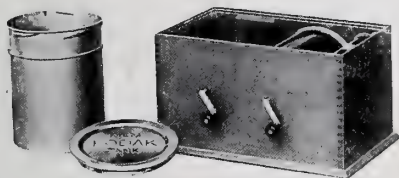
THE PRICE

Kodak Enlarging Outfit	\$25.22
Lantern Slide Block	.75
Portrait Attachment No. 5	.75

EASTMAN KODAK COMPANY

ROCHESTER, N. Y.

All by Daylight



KODAK FILM TANK

TAKE it with you—there's plenty of room for it in your vacation luggage. The outfit is self-contained as the metal tank fits in the box. And think of the pleasure of seeing "how the pictures came out" whenever you will, wherever you are.

Price, **\$3.50** up

EASTMAN KODAK COMPANY

ROCHESTER, N. Y.

Kindly mention THE PHOTO-MINIATURE

“Kodak Literature”

For the Amateur Who Wants to Know the Why of What He Does

Bromide Enlarging with a Kodak

An understandable pamphlet that tells how to improvise an enlarging outfit with any focusing camera that has a removable back. *Free.*

About Lenses

The better you know your lens, the better prepared you are for picture-making. This booklet, containing numerous illustrations and diagrams, will give you information you ought to have regarding the various kinds of lenses used in photography. It offers you as well, in non-technical language, an insight into elementary photographic optics. *Free.*

Lantern Slides

Deals with the making and coloring of lantern slides. *Free on application.*

The Fundamentals of Photography.

By DR. C. E. K. MEES

As the author explains in his preface, this book provides an elementary account of the theoretical foundations of photography, in language which can be followed by readers without any

specialized scientific training. In an interesting fashion it gratifies a perfectly natural curiosity as to the composition of the materials used and their reaction when exposed to light and treated with the various photographic chemicals. Price \$1.

Elementary Photographic Chemistry

The chemistry of photography, with a description of the preparation and properties of the chemicals used, is presented in a clear fashion; and the information contained between its covers is invaluable to the serious amateur. 80 pages. *Free.*

How to Make Good Pictures

A practical book for the amateur that covers in a simple understandable way every phase of photography that he is likely to be interested in. 170 pages. Price 40 cents at your dealer's.

The Photography of Colored Objects

describes, in simple language, the principles and practice of orthochromatic and panchromatic photography. 50 cents postpaid.

EASTMAN KODAK COMPANY

ROCHESTER, N. Y., *The Kodak City*

EASTMAN

PORTRAIT BROMIDE

Made specially for portrait enlarging—
which means that it will reproduce the
quality of the ideal portrait negative.

It has ample speed, the long scale of
gradation which especially suits the portrait
negative, and yields carbon-brown tones of
distinctive richness with the ordinary re-
development process.

Supplied in two colors and two surfaces.

D White, Rough Matte	E Buff, Rough Matte
D White, Rough Lustre	E Buff, Rough Lustre

At prices the same as for D. W. Artura Iris.

EASTMAN KODAK COMPANY

ROCHESTER, N. Y.

All dealers'

Carl Zeiss Jena

PHOTOGRAPHIC LENSES

Series Ic

F.3.5 : F.4.5

Series IIb

F.6.3

PRISM BINOCULARS

Many Types

3 to 18 Magnifications

MICROSCOPES ASTRONOMICAL AND OBSERVATION TELESCOPES

Catalogues on Request

HAROLD M. BENNETT

U. S. Agent

110 East 23rd Street

New York

Ica Cameras

Miniature Cameras

ATOMS BÉBÉS

ICARETTES [Roll Film]

Hand Cameras

IDEALS LLOYD [Roll Film] TRIX B

HALLOH [Roll Film]

Speed Cameras

MINIMUM PALMOS

ICA REFLEX CAMERA

[Focal Plane]

Stereoscopic Cameras

STEREOFIX STEREOLETTE

POLYSCOPE

Illustrated Catalogue on Request

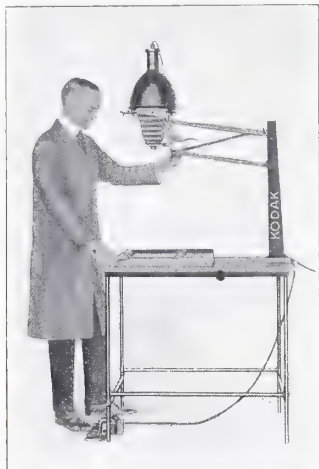
HAROLD M. BENNETT

U. S. Agent

110 East 23rd Street

New York

Kindly mention THE PHOTO-MINIATURE



Kodak Projection Printer

*An instrument that
simplifies the making of
large prints from
small negatives*

THE Kodak Projection Printer is not merely an improved piece of apparatus. It embodies an entirely new idea—revolutionizes enlarging and changes it into a simple printing process—projection printing.

The idea is based on the scientific and mechanical accuracy of the instrument itself, and the process is simple and easy.

The image is always in focus—move the camera up or down and the image expands or shrinks but always remains hair sharp, so accurate is the automatic focusing mechanism.

The Printer will take negatives $3\frac{1}{4} \times 5\frac{1}{2}$, 4×5 or smaller and will make prints up to 24×32 inches.

Kodak Projection Printer, complete with Kodak Projection Anastigmat Lens *f.* 6.3 and 100 Watt Stereopticon Mazda Lamp, is priced at \$200.00.

Send for booklet "Printing with the Kodak Projection Printer"

EASTMAN KODAK COMPANY

ROCHESTER, N. Y., *The Kodak City*

A paper for better portrait prints

All of the delicate gradation—all of the richness of tone—all of the roundness and depth of the ideal portrait enlargement are secured in the print on

EASTMAN PORTRAIT BROMIDE

Rich black tones by straight development—beautiful carbon-brown, sepia tones by re-development. Supplied in two colors of stock and two surfaces.

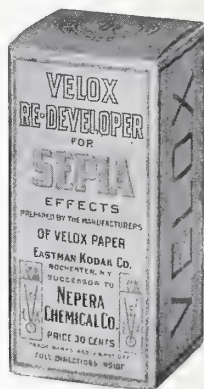
D White Rough Matte	E Buff Rough Matte
D White Rough Lustre	E Buff Rough Lustre

At prices the same as for D.W. Artura Iris

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

All Dealers'

*Sepia-toned
prints are
easily secured
with*



Velox Re-Developer

The original black and white print emerges from the re-developer a rich, warm brown—a particularly happy tint for landscapes and portraits.

Velox Re-Developer is put up in two forms—bottle and tube. The four ounce bottle will tone approximately 75 8 x 10 size prints or their equivalent—each of the tubes, which may be purchased separately or in cartons of twelve, will re-develop about one dozen 8 x 10 size prints.

The Price

Velox Re-Developer, per 4 ounce bottle	\$.50
Ditto, 2 ounces	.30
Velox Re-Developer Tubes, per package 12 tubes	.84

EASTMAN KODAK COMPANY
ROCHESTER, N. Y.

At your dealer's



Just as the sun rises and pursues
its way unfalteringly to sunset,
so can

DALLMEYER LENSES

be trusted to give perfect pictures with the same regularity, and perform the several photographic tasks each type is designed to accomplish.

Their reputation has been built up on the fact that they answer the extreme needs of the photographic worker.

The lens is the most important part of the photographic outfit, so, if the lens is good your photographs will be good.

Ask your dealer for the Dallmeyer catalogue. It is full of interesting information about every type of lens we make. Dallmeyer lenses can be ordered through all reputable dealers. If your dealer cannot supply the new catalogue, we will send it with pleasure on request.





CARL ZEISS PHOTOGRAPHIC LENSES are the exclusive product of the world renowned Zeiss works at Jena, famous as the birthplace of the modern anastigmat.

Zeiss standards of scientific construction and optical accuracy make it impossible to offer Zeiss objectives at prices competitive with photographic lenses of unequal quality.

If supreme photographic excellence, unequalled definition, and flatness of field, with maximum illumination are your requirements, your next lens must necessarily be a Carl Zeiss.

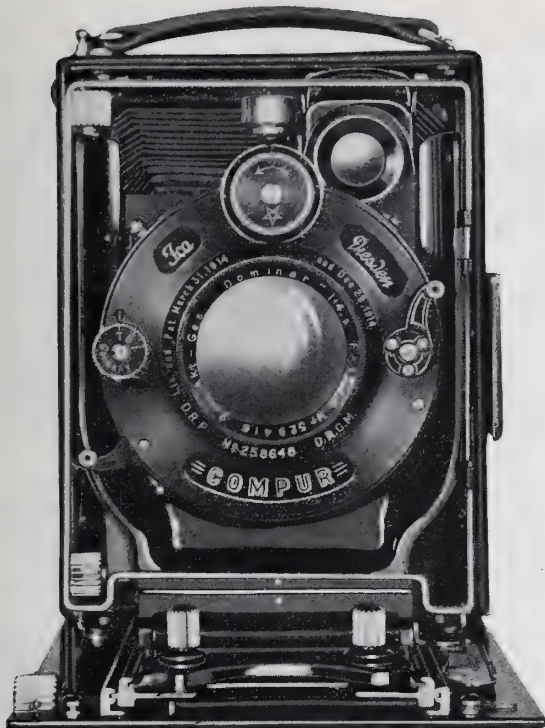
Harold M. Bennett

U. S. AGENT

153 West 23rd Street

New York

Kindly mention THE PHOTO-MINIATURE



The Ideal B fitted with the DOMINAR LENS, $f/4.5$

The Dominar is a new Ica Anastigmat, an $f/4.5$ lens that will appeal to the most discriminating, yet moderate in price. It is just the kind of a lens you would expect of Ica. Most of the Ica Cameras can now be had with Dominar lenses.

Harold M. Bennett

U. S. AGENT

153 West 23rd Street

New York

Kindly mention THE PHOTO-MINIATURE

For the shortest days of the year use the longest plates
in the market

HAMMER PLATES

are EXTRA LONG in speed, detail, color value and every quality that goes to make a perfect negative. Special brands for special needs.

Hammer's Special Extra-Fast (red label) and Extra-Fast (blue label) Plates for field and studio work, and Hammer's Extra-Fast Orthochromatic and D. C. Orthochromatic Plates for color-values.



HAMMER DRY-PLATE COMPANY
Ohio Avenue and Miami Street, ST. LOUIS, MISSOURI

PHOTO-ENGRAVERS' MACHINERY

JOHN ROYLE & SONS
PATERSON, N. J.

SMASHING REDUCTIONS

Send for Bargain List No. 25

NEW YORK CAMERA EXCHANGE
114 Fulton Street, New York

Kindly mention THE PHOTO-MINIATURE

There is a profitable field of camera work for the amateur who can make really clever photographs of flowers, trees, gardens, etc., for the outdoor life and country magazines, farm papers, book publishers and for calendar use.

GET *and* READ

J. Horace McFarland's
PHOTOGRAPHING
FLOWERS
AND TREES

The only handbook to this fascinating and profitable hobby—with a supplement on "Decorative Photography," showing how all natural forms are adapted for illustration purposes. Covers the subject completely, with detailed working methods from practical experience.

A gold mine book for those who can put it to work.

PROFUSELY ILLUSTRATED

93 pages, 73 illustrations
frontispiece in colors

Price 50 cents, post free

TENNANT & WARD
103 PARK AVE., NEW YORK

GRAF SUPER LENSES

The Utmost
in Quality

THE GRAF VARIABLE

Anastigmat and Soft Focus lens in one. Adjustable for diffusion without stopping down—from sharp to soft definition at full opening of the diaphragm.

No halo or run around
Wide open F:4.5

GRAF SUPER ANASTIGMAT F:4.5 F:6.3 F:7.7

Send for Descriptive List and Announcement of the Cash Prize Competition for Users of Graf Lenses.

GRAF OPTICAL CO.
South Bend, Indiana

NEW YORK OFFICE
JOHN WALLACE GILLIES
80 West 40th St., New York
CHICAGO OFFICE
EUGENE HUTCHINSON
410 Michigan Ave., Chicago

GRAF SUPER LENSES

The Monomethylparamidophenol Sulphate which is 100% pure is

METAGOL, "CIBA"

Made by the Society of Chemical Industry in Basle, Switzerland;
makers of standard chemicals since 1864.

AT YOUR DEALER'S OR WRITE US

Leading photographic paper-manufacturers are recommending
and three-fourths of the motion-picture industry are using

METAGOL, "CIBA" and HYDROQUINONE "CIBA"

"There's a Reason"

TRADE



MARK

REGISTERED

CIBA COMPANY, INC. CEDAR AND WASHINGTON STREETS
NEW YORK CITY

The Simplest and Most Practical Course of Instruction in Retouching,
Finishing and Coloring Methods. 90 pages, with 16 plates; 6 x 9 in.,
postfree, \$2.50

The Art of Retouching Negatives and Finishing and Coloring Photographs

By ROBERT JOHNSON

Tenth Edition. Completely Rewritten, Enlarged and
Profusely Illustrated by T. S. Bruce and A. Braithwaite

Part I. Negative Retouching.

Material for Negative Retouching. Position of Desk. Sharpening Pencils.
Applying Medium, etc. Knife and "Negatake" Work. Position at desk. Cor-
rect Holding of Pencil. Best Touch for Beginners. What to Aim At. Varnish-
ing. Double-Working. Modelling. General Remarks on Modelling. Hair
and Dress. Foliage and Grass, Snow, Clouds and Water, Animals, Spotting,
Stumping, Blocking Out, etc.

Part II. Finishing and Coloring Enlargements.

Working-up. Enlargements in Monochrome. Powder Work. Cloudy Back-
grounds. Vignetting. Brush Work. Treating the Hair, Eyes, etc. Small
Work. Sketch Portraits. Using the Aerograph. B. & W. Work. Working in
Water-Colors. Finishing in Oil-Colors, etc.

Tennant and Ward, 103 Park Avenue, New York



“WOHLITE”

A highly developed electric arc lamp adapted for use in either the studio or the home.

JUST AS ESSENTIAL TO THE PHOTOGRAPHER AS HIS CAMERA

Always dependable for instantaneous exposures of one quarter second or less. Has a double current range and

CAN BE USED ON EITHER DIRECT OR ALTERNATING CURRENT

without any change in connections

We make lamps for every photographic need. Send for Bulletins and further information.

M. J. WOHL & CO., Inc.

Paynter Avenue and Hancock Street
LONG ISLAND CITY, N. Y., U. S. A.

*Write for information
now while thinking of it*

ALDIS ANASTIGMAT F:3 LENSES F:3

*Indisputably
the Best*

A New Formula assuring splendid definition or wonderful softness at will, with complete absence of ghost or flare.

Booklet on Request

AMERICAN AGENT

J. L. LEWIS

522 SIXTH AVE., NEW YORK

BARNET BROMIDE PAPERS

*for enlargements
of quality*

Made in Several Grades
CREAM, CRAYON, ROUGH
is especially recommended for
BROMOILS and Pictorial Work,
both Portraits and Landscapes

Circular on Request

AMERICAN AGENT

J. L. LEWIS

522 SIXTH AVE., NEW YORK

METEOR PHOTO CHEMICALS

JOHN G. MARSHALL

1752 Atlantic Avenue, Brooklyn, New York

CYNTOL (Metol)

RODINAL

Universal Concentrated Liquid Developer. Simply dilute 1-10 to
1-40 with water. Keeps indefinitely

GLYCIN

The Ideal Non-Staining Tank Developer and all other
photo chemicals

SEND FOR CATALOG W.

The only practical method available today
for obtaining

PHOTOGRAPHS IN COLORS

faithfully reproducing any subject in all its
beauty of color is the use of

LUMIÈRE

AUTOCHROMES

Simple in Use

Certain in Result

*Send today for the Autochrome Handbook giving Formulas and
Full Working Methods. FREE ON REQUEST*

GRIFFIN PLATE DEVELOPING TANKS

Plates are put in in the darkroom, or in a changing bag, and all other opera-
tions are carried out in the light.

R. J. FITZSIMONS

U. S. Agent.

75 Fifth Avenue, New York

Kindly mention THE PHOTO-MINIATURE

PLATINOTYPE

[Pure Platinum]

PALLADIOTYPE

[Pure Palladium]

SATISTA

[Platinum and Silver]

The papers de luxe Send for latest lists

WILLIS & CLEMENTS, 1814 Chestnut St., Philadelphia, Pa.

O.D.D. *What is it?*

AN OPTICAL DIVERGENCE DETERMINER

for hand cameras. A *scientific precision device* which adds to the hand camera all the distinctive advantages of the professional camera with ground glass focusing screen, viz: you get the full value of your lens as to the amount of subject included in the view, correct linear perspectives and perfect control of the spacing—foreground, middle, distance and sky, thus ensuring success in your picture making. Simple in use, effective in results, with less outlay—avoids waste.

Price \$6. Send for descriptive leaflet to

A. FREEMAN PICTORIAL PHOTO AND MFG. CO.
Photo M. COLORADO SPRINGS, COLO.

GLYPHOSCOPE—Richard

Stereo Photography at Small Cost

LATEST MODEL

\$15.00

Possesses the fundamental qualities of the famous Richard Verascope

Write for information about any stereo apparatus

U. S. Agent

R. J. FITZSIMONS
77 Fifth Avenue, New York

**A Boon to Pictorialists
A Revelation to the
Beginner**

SUCCESS or FAILURE
with your camera is **PLAINLY**
VISIBLE thru

**SCHEIBE'S
MONOTONE
FILTER**

which shows you what you will
get before clicking the shutter

Motion picture cameramen are
enthusiastic about it

Price \$3

At your dealers or from

GEORGE H. SCHEIBE

Photo Filter Specialist
701 NORTH BELMONT AVE.
LOS ANGELES, CAL.

The Photo-Miniature ; No. 184

**SOFT-FOCUS
EFFECTS IN
PHOTOGRAPHY**

A plain statement of the common sense of the matter; with an account of all the soft-focus lenses, disks, screens and other diffusion devices; instructions in their use, with illustrations, and a few notes from the experience of prominent photographers who use them.

Price 40 cents

At Your Dealers

TENNANT AND WARD

Publishers
103 Park Avenue New York

Everything worth while has its imitators and competitors. But no one has yet produced an air brush to equal the

WALKUP AIR BRUSH

for obtaining the artistic effects and fine detail work required by the photographer. That's why experts who have used it over 20 years still prefer and use the Walkup Air Brush. Made at Rockford, Illinois, under the supervision of the original inventor and patentee, Liberty Walkup. Send for unsolicited testimonials of users.

Buy the right air brush

AIR BRUSH MFG. CO., Rockford, Ill.

Our Booklet of Soft Focus Lenses,

Written and illustrated by five famous pictorialists
will be sent you free on request. It describes the

SMITH "SYNTHETIC"
and other **SOFT FOCUS LENSES**
also the new **WOLFE "ARTISTIC"**

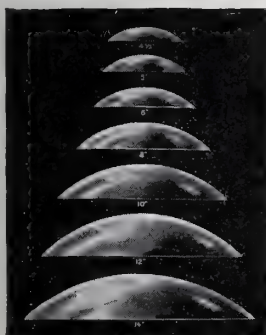
which converts the lens on your camera into a soft focus lens at will—
without any change of focus scale, etc.

PINKHAM & SMITH COMPANY

Two Stores

292 Boylston Street
13 Bromfield Street

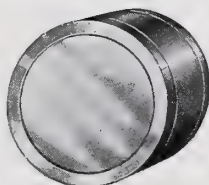
Boston, Mass.



IMPORTED CONDENSERS
All diameters and focal lengths

**Imported French
PHOTOGRAPHIC
CONDENSERS**

*for Enlarging
and Reducing*



SPECIAL OFFER

4 in. diameter mounted in metal, per pair	\$2.75
4 1/2 in. " " " " "	3.00
7 " " " " "	10.00
8 " " " " "	15.00
12 " " " " "	37.50

J. H. B. DONALDSON ENTERPRISES

Dept. E, 1591-1597 BROADWAY, NEW YORK CITY

Let us supply your photographic needs

We carry full and ample stocks of

**HAND, VIEW AND STUDIO CAMERAS
LENSES—ALL KINDS AND MAKES**

Printers—Enlargers—Washers—Driers

ARTIFICIAL LIGHT EQUIPMENTS

EVERYTHING PHOTOGRAPHIC

Send for New Lists

Let us quote prices

GEORGE MURPHY INC., 57 East 9th Street, NEW YORK

Kindly mention THE PHOTO-MINIATURE

The photographic book market has not yet got "back to normalcy" and there are few books to be had—none at all on many subjects. *But our*

MONTHLY BOOK LIST

includes almost all the "worth while" books at present obtainable on the different branches of photographic work. Tell us what you want to know and we will advise you of the best books for your need, sending you the list at the same time.

TENNANT AND WARD

Publishers and Importers
103 PARK AVE., NEW YORK



QUALITY LENSES

AT

MODERATE PRICES

Wollensak products are sold on a basis of quality, not of competitive price. The fact that prices are lower than others testifies to our efficient production methods. It is a pleasure to be able to offer such fine equipment at the reasonable prices prevailing, but we invite your comparison particularly with reference to genuine merit rather than price alone.

Ask for our latest price list and descriptive literature.

WOLLENSAK OPTICAL CO.
Rochester, N. Y.



Air Brush Colours **WINSOR & NEWTON'S** "Winchester Aerograph" Colours

Suitable for Decorative Designing, Illustration, Etc.
Water colours for miniature painting. Transparent oil colours for colouring photographs and lantern slides.

Everything for the Artist
Send for Colour Chart and Circular M-2
"Common Causes of Air Brush Failures"

WINSOR & NEWTON, Inc., 31 East 17th St., New York

Chemically Pure, Non-Linting, Durable, Economical
FOR EVERY PHOTOGRAPHIC PURPOSE

"PHOTO FINISH WORLD"

BLOTTER IS THE BEST IN THE WORLD

INSIST ON "PHOTO FINISH WORLD." YOUR DEALER HAS IT

Write Us For Working Sample

THE ALBEMARLE PAPER MFG. CO., RICHMOND, VA., U. S. A.

Kindly mention THE PHOTO-MINIATURE

The amateur who seeks an ideal process for the making of his exhibition prints, and the professional seeking a new and distinctive printing method should get and read

THE PHOTO-MINIATURE: No. 185

KALLITYPE AND ALLIED PROCESSES

A comprehensive and practical handbook, giving working methods and formulas for the preparation of plain silver prints (black or brown tones) on art papers; silver-platinum prints; platinotype on special papers, copper, uranium and blue prints.

PRICE 40 CENTS

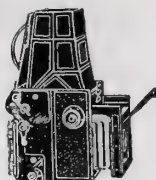
At your dealers, or from
TENNANT AND WARD
103 Park Ave. New York, N. Y.

JUST OUT OUR LATEST Bargain Book and CATALOG

Send at once for your copy and you will be convinced that we can save you money and give you satisfaction. We have pleased thousands. You will find hundreds of used and new Cameras, Kodaks, Lenses, and supplies of every description listed at remarkably low prices. Every item sold is guaranteed.

10 Days' Free Trial or Money Back if unsatisfactory. If you wish to trade your present outfit for some other, write us for particulars.

Central Camera Co.
Dept. M-3
124 S. Wabash Ave., Chicago, Ill.



**GRAFLEX
KODAKS
CAMERAS**

AT REAL

BARGAINS

Trade your old camera
to BASS for a new one

Get your name on the
BASS MAILING LIST NOW

BASS CAMERA CO.

Dept. M, 109 N. Dearborn Street
CHICAGO

N. B.—THE BASS STOCKS OF
MOTION PICTURE APPARATUS
ARE THE WORLD'S LARGEST.

CONSISTENTLY BETTER RESULTS

THE **REXO** WAY

"Every Click a Picture"

REXO CAMERAS have five picture saving features which simplify photography, correct the user's mistakes and insure a higher percentage of good pictures. The Rexo Book explains these advantages in detail. Ask your dealer for a copy and choose a Rexo, for the sake of better pictures every time.



REXO SAFETY FILM

insures clear, snappy negatives from which you will get quality pictures, particularly if made on REXO PAPER.

BURKE & JAMES, Inc.

Rexo Photo Products and Universal
Motion Picture Cameras

CHICAGO - NEW YORK

Kindly mention THE PHOTO-MINIATURE

Tennant and Ward's List

Wall's Dictionary of Photography

Tenth Edition, 1920. Revised to date and largely rewritten by F. J. Mortimer. 700 pages; 2,000 references. Cloth: postpaid \$5.

The Photographic Researches of Ferd. Hurter and Vero C. Driffield

A Memorial Volume, edited by W. B. Ferguson and republishing all their original papers with a Bibliography of Later Work. 374 pages. Illus. Cloth \$9.

Photograms of the Year 1921

An International Illustrated Review of the World's Progress in Pictorial Photography. Reports of the Great Exhibitions, a Critique and 86 Plates. Stiff paper covers \$2.50. Cloth, \$3.50 postpaid.

Penrose's Annual 1922

The Process Year Book and Review of Graphic Arts. Volume 24. Edited by W. Gamble. With 88 plates in color, gravure and other methods. Postpaid \$4.

Practical Photo-Micrography

The Principles and Methods Plainly Explained for Beginners. A common-sense book. By Geo. West. 160 pages; with 8 plates, table, etc. Postpaid \$2.50

Bromoil, Bromoil Transfer and Oil Prints

By James A. Sinclair, Fred Judge and other experts. Practical Working Methods. Illustrated. Postpaid \$1.

Photographing Flowers and Trees

With an essay on "The Decorative Use of Natural Forms." By J. Horace McFarland. 93 pages; 35 illustrations. 50 cents.

The Photo-Miniature Series

Monographs on Photography. Edited by John A. Tennant. See special list for titles. Per copy 40 cents. Per year \$4.

The Art of Retouching Negatives and Finishing and Coloring Photographs

Johnson's standard handbook. Rewritten and enlarged by Bruce and Braithwaite. Tenth edition 1920. Price \$2.50.

Photography Made Easy

By R. Child Bayley. The best first book for beginners. Simple; practical. 261 pages. Stiff paper covers. \$1.50.

*We can supply any book on photography
—at the publisher's price. Send for list.*

**TENNANT AND WARD, PUBLISHERS
103 PARK AVENUE, NEW YORK**

How to Develop the Negative

A practical guide to all the methods approved in practice, explaining their advantages and giving working instructions covering their use—with formulas.

THE PRINCIPLES OF DEVELOPMENT

THE CLOSED TANK METHOD

THE OPEN TANK METHOD WITH CORE'S RACKS DESCRIBED IN DETAIL

THE FACTORIAL SYSTEM

WALLACE TIME AND TEMPERATURE METHODS

DEVELOPING UNKNOWN EXPOSURES

DEVELOPMENT AT HIGH TEMPERATURES

COMPARISON OF VARIOUS DEVELOPERS FOR CAPACITY

INSTANTANEOUS DEVELOPMENT

Price 40 cents postfree

TENNANT AND WARD
103 PARK AVE., NEW YORK



For 20 years these albums have been made uniformly good. If your dealer does not carry the full line, write for price list. The extensive variety shown will interest you.

THE HOUSH COMPANY, *Makers*
7-17 E. Concord St., Boston, Mass.



BROMOIL PAPER

White Smooth
and Cream Rough
in double weight only

The easiest paper to pigment
Send for our complete Bromoil List

Manufactured by
Wellington & Ward
Elstree, Herts

Sole United States Agents
RALPH HARRIS & CO.
26-30 Bromfield St., Boston, Mass.

AT every step in picture-making, ABE COHEN'S EXCHANGE can serve you--

**KODAKS, GRAFLEX
AND VIEW CAMERAS
SOFT FOCUS AND
PORTRAIT LENSES**

Enlarging Outfits
Photographic Papers
and Developers

**BROMOIL
SUPPLIES**

*Reduced prices on photographic
apparatus now in effect.*

**ABE COHEN'S
EXCHANGE**
113 PARK ROW NEW YORK



Every Photographer
should have

**WILLOUGHBY'S
MONEY SAVING
BULLETIN**

before placing orders
for anything
photographic

A Square Deal Always

WILLOUGHBY
Cameras & Supplies,
110 West 32 St. * * * * N. Y.

**KALLITYPE AND
ALLIED PROCESSES**

The Photo Miniature: No. 185. 40 cents. At your dealers. Working methods and formulas for plain Silver Prints, Platinotype, Silver-Platinum, Copper and Blue Print Papers.

Professional or Amateur Require the Best
tools obtainable for retouching

"CASTELL" PENCILS AND LEADS
give the best results

Absolutely Flawless A. W. FABER, Inc., NEWARK, N. J.

DUNN—THE LENS MAN

Bargains. Any Lens at the right price.

No List. Stock changing daily. I can save you
money. Tell me your wants. Prompt reply.

HATHAWAY DUNN INC., 22 East 30th St., NEW YORK

Genuine
HAND-MADE
- and of
exceptional
PURITY

WHATMAN PAPERS
for Photographic uses - SENSITIZING
MOUNTING Etc.

Write us
for free
Sample
book &
information

H. REEVE ANGEL & Co., Inc., 7-11 Spruce St. New York

Kindly mention THE PHOTO-MINIATURE

1000 EXPERIMENTAL EXPOSURES

will not give you as much information as the
No. 2 HARVEY EXPOSURE METER
which costs \$2.00, including Book 40 on
AUTOMATIC PLATE DEVELOPMENT
HARVEY MOTION PICTURE METER \$2.00

Your dealer or **G. L. HARVEY, 105 S. Dearborn St., Chicago**

Clarence H. White School of Photography

SPRING SESSION—CANAN, CONN.,
May 15 to May 31 "Blossom Time"

Special instruction in hand camera and pictorial work

For information, address **460 West 144 Street, NEW YORK CITY**

HENRIETTA HUDSON

PERMANENT LANTERN SLIDES

For Technical and Educational Purposes

Direct Color Photography—Research Work—Consultation

BOLTON LANDING ON LAKE GEORGE, WARREN CO., N. Y.

USE THE CORRECT EXPOSURE

Milner
**LIGHT
GAUGE**

SIMPLE & CONVENIENT

NO Sensitized paper or
renewals
NO Calculations or fac-
tors
NO eye strain—nothing
to look through

DEALER OR DIRECT, POSTPAID \$1.50. Money back if not satisfied
G. M. MILNER, - - - FAIRFAX, CALIF.



We carry a fairly complete stock of many of the

Out-of-Print Numbers The Photo - Miniature

in good condition **50 cents.** Send prepaid order for
numbers wanted. We will refund for all not supplied.

TENNANT AND WARD, 103 Park Ave., New York

FOR the amateur who wants good pictures, or for the serious worker
who must have the best, it is well to have the development and
printing done by one who has studied this kind of work and is willing
to give the proper time and attention to it.

Developing, printing and enlarging at my place is all handled with
the utmost care, and the results obtained are exceptionally satisfactory.
Write for information about my methods.

MILES GREENWOOD, 84 Cottage Street, Melrose 76, Mass.

Work from my shop is a standard of excellence.

Kindly mention **THE PHOTO-MINIATURE**

HIGGINS'

PHOTO MOUNTER PASTE



The kind you are sure to use
with continuous satisfaction

At Dealers Generally

Chas. M. Higgins & Co., Manufacturers
271 Ninth St., Brooklyn, N. Y.

Branches:
Chicago, London

HORGAN'S PHOTO-ENGRAVING PRIMER

Practical Working Methods for Making Line and Half-tone Cuts

By Stephen H. Horgan. For all who want practical knowledge

CLOTH BOUND, \$1.50 POST FREE

RAYMER'S HANDBOOK ON ETCHING AND FINISHING

Line, Half-tone and Color Blocks. By P. C. Raymer. \$1.50

TENNANT & WARD, 103 Park Avenue, New York



Earn \$35 to \$100 a Week

BECOME A PROFESSIONAL
PHOTOGRAPHER



Good positions in this fascinating profession open now
throughout the country.

Three months' course covers all branches

MOTION PICTURE : COMMERCIAL : PORTRAITURE

Practical instruction, day or evening.

Easy payments. Write today for catalog No. 24, "How to Be-
come a Professional Photographer."

NEW YORK INSTITUTE OF PHOTOGRAPHY

141 West 36th St., New York

505 State St., Brooklyn

**IF YOU WANT TO GET IN YOUR PRINT
WHAT YOU SEE IN THE SUBJECT—READ**

Photography as a Craft

By T. O'Connor Sloane, Jr., in The Photo-Miniature No. 178. A
practical guide to negative making and printing for the serious
worker who knows what he wants.

PRICE 40 CENTS. AT YOUR DEALER'S

TENNANT AND WARD, 103 Park Ave., New York

Kindly mention THE PHOTO-MINIATURE

The Photo Miniature

The most comprehensive reference library of photographic information in the English language

8000 solidly packed pages, illustrated; unique in plan and arrangement. Every page self-indexed for quick reference.

Comprising 180 handbooks on photography, each complete in itself; each dealing with a different subject or phase of its subject.

Covering all the everyday uses and applications of photography with direct and practical instruction—theory and practice; much of it original and not obtainable elsewhere.

Giving the commonsense facts needed for an intelligent understanding and successful working of the processes, methods and formulas employed.

This describes a complete set of The Photo-Miniature: Vol. 1, No.1 (1899) to Vol. XV, No. 180 (1920) as published, strong paper covers

PRICE ON APPLICATION

TENNANT AND WARD, Publishers

103 PARK AVENUE

NEW YORK, N. Y.

Kindly mention THE PHOTO-MINIATURE

Confidence in Eastman
Tested Chemicals is con-
firmed by continual, prac-
tical proof of their ability
to produce results.

*It's good business to specify
E. K. Co. Tested*



EASTMAN KODAK COMPANY

ROCHESTER, N. Y.

All Dealers'

Kindly mention THE PHOTO-MINIATURE